



# RADIO TEST REPORT


Test Report No. : 11138084H-B

**Applicant** : FUNAI ELECTRIC CO., LTD  
**Type of Equipment** : SOUNDBAR  
**Model No.** : FWSB426F  
**FCC ID** : ADTXHB00UH1  
**Test regulation** : FCC Part 15 Subpart C: 2015  
**Test Result** : Complied


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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)

**Date of test:** February 5 to 10, 2016

**Representative test engineer:**

  
Yutaka Yoshida  
Engineer  
Consumer Technology Division

**Approved by:**

  
Takahiro Hatakeda  
Leader  
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.  
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[http://japan.ul.com/resources/emc\\_accredited/](http://japan.ul.com/resources/emc_accredited/)

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13-EM-F0429

# REVISION HISTORY

## Original Test Report No.: 11138084H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11138084H-B	February 29, 2016	-	-

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## **SECTION 1: Customer information**

Company Name : FUNAI ELECTRIC CO., LTD  
Address : 7-1, 7-chome, Nakagaito, Daito, Osaka 574-0013, Japan  
Telephone Number : +81-6-6730-8785  
Facsimile Number : +81-6-6730-8786  
Contact Person : Masao Tani

## **SECTION 2: Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

Type of Equipment : SOUNDBAR  
Model No. : FWSB426F  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : AC 120 V / 60 Hz  
Receipt Date of Sample : February 1, 2016  
Country of Mass-production : China  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

Model: FWSB426F (referred to as the EUT in this report) is a SOUNDBAR.

#### **General Specification**

Clock frequency(ies) in the system : System clock: 148.5 MHz, Digital AMP: 98.3 MHz,  
SPDIF clock: 24.576 MHz, AUDIO DAC clock: 24.576 MHz,  
Sub-CPU: 18.432 MHz

#### **Radio Specification**

##### **[Bluetooth (Ver4.1 with EDR function)]**

Radio Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Modulation : FHSS  
Power Supply (radio part input) : DC 3.3 V  
Antenna type : Monopole Antenna  
Antenna Gain : 2.3 dBi  
Antenna connector : Direct Connect

## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2015, final revised on November 23, 2015  
\*Some parts are effective on and after December 17, 2015 or December 23, 2015. The revision does not affect the test specification applied to the EUT.

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

\* The EUT complies with FCC Part 15 Subpart B: 2015, final revised on January 21, 2015.

### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods IC: RSS-Gen 8.8	FCC: Section 15.207 IC: RSS-Gen 8.8	QP 17.4 dB, 0.38490 MHz, L AV 9.8 dB, 0.38635 MHz, N 0.38490 MHz, L	Complied	-
Carrier Frequency Separation	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (2)	See data.	Complied	Conducted
20dB Bandwidth	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1) IC: RSS-247 5.1 (1)		Complied	Conducted
Number of Hopping Frequency	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Dwell time	FCC: FCC Public Notice DA 00-705 IC: -	FCC: Section15.247(a)(1)(iii) IC: RSS-247 5.1 (4)		Complied	Conducted
Maximum Peak Output Power	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.12	FCC: Section15.247(b)(1) IC: RSS-247 5.4 (2)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 6.13	FCC: Section15.247(d) IC: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10		3.5 dB 154.950 MHz, Vertical, QP 155.730 MHz, Vertical, QP	Complied

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.  
\*1) Radiated test was selected over 30 MHz based on section 15.247(d).  
\* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

#### **FCC Part 15.31 (e)**

This EUT provides stable voltage (DC 3.3 V) constantly to RF Part regardless of input voltage. Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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### 3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 6.6	IC: -	N/A	-	Conducted

Other than above, no addition, exclusion nor deviation has been made from the standard.

### 3.4 Uncertainty

#### EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor  $k = 2$ .  
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Antenna terminal test Uncertainty (+/-)							
Power meter		Conducted emission and Power density			Conducted emission		Channel power
Below 1 GHz	Above 1 GHz	Below 1 GHz	1 GHz - 3 GHz	3 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz	
0.9 dB	1.0 dB	1.4 dB	1.7 dB	2.8 dB	2.8 dB	2.9 dB	

Frequency range	Conducted emission using AMN(LISN) (+dB)
0.009 – 0.15MHz	3.5 dB
0.15 – 30MHz	2.9 dB

Test distance	Radiated emission (+dB) 9 kHz - 30 MHz
3m	3.8 dB
10m	3.7 dB

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+dB)		(10 m*)(+dB)	
	30 – 300 MHz	300 – 1000MHz	30 – 300 MHz	300 – 1000MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	4.5 dB	5.9 dB	4.8 dB	5.1 dB

Radiated emission				
(3 m*)(+dB)		(1 m*)(+dB)	(0.5 m*)(+dB)	(10 m*)(+dB)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.1 dB	5.3 dB	5.1 dB	5.1 dB	5.3 dB

\*Measurement distance

#### Conducted Emission test

The data listed in this test report has enough margin, more than the site margin.

#### Radiated emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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### 3.5 Test Location

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Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating Mode(s)**

Bluetooth (BT): Transmitting (Tx), Payload: PRBS9

Details of Operating Mode(s)

<b>Test Item</b>	<b>Mode</b>	<b>Tested frequency</b>
Conducted Emission, Spurious Emission (Conducted/Radiated)	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx (Hopping On) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
20dB Bandwidth	Tx (Hopping Off) DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx (Hopping On) DH5, 3DH5	-
Dwell time	Tx (Hopping On), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5	-
Maximum Peak Output Power	Tx (Hopping Off) DH5, 2DH5, 3DH5	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2480 MHz
99% Occupied Bandwidth	Tx DH5, 3DH5 -Hopping On -Hopping Off	2402 MHz 2441 MHz 2480 MHz
<p>*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)  *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.</p> <p>*EUT has the power settings by the software as follows;  Power settings: BR : 42, EDR : 37  Software: Airoha AB1500 Family LAB Test Tool Version 1.4.15.0  Bluetooth Module Firmware Version: 20160119</p> <p>*This setting of software is the worst case.  Any conditions under the normal use do not exceed the condition of setting.  In addition, end users cannot change the settings of the output power of the product.</p>		

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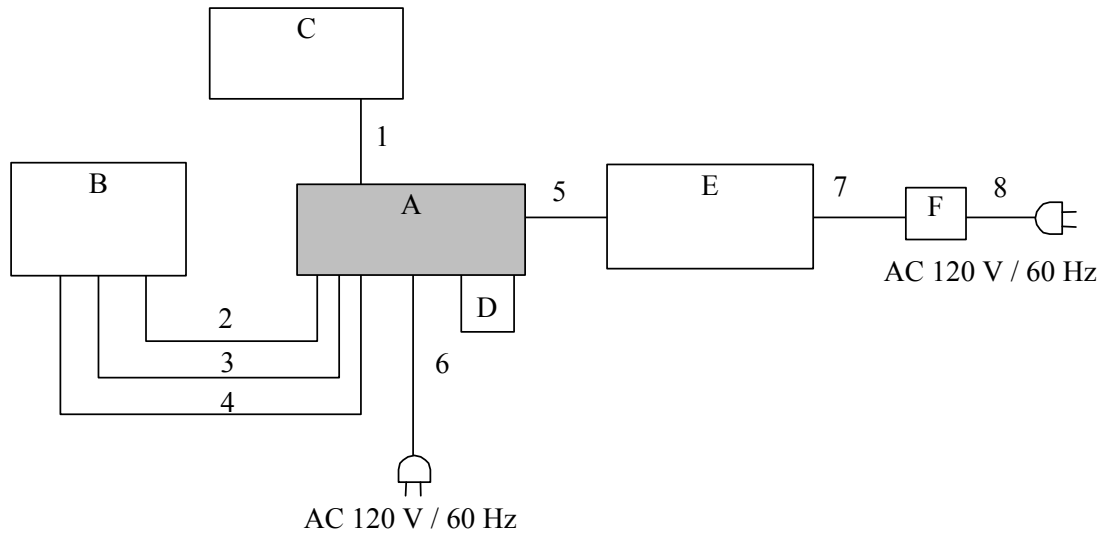
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## 4.2 Configuration and peripherals



\*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	SOUNDBAR	FWSB426F	66 *1) 12 *2)	FUNAI ELECTRIC CO., LTD	EUT
B	BD/DVD PLAYER	BDP-BX57	1104409	SONY	-
C	AUDIO PLAYER	MD531J/A	F9GP34WAF196	APPLE	-
D	USB MEMORY	RUF2-YUF16GS	I 10801	BUFFARO	-
E	PERSONAL COMPUTER	PSA50N-0C3066	00045-557-620-986	TOSHIBA	-
F	AC ADAPTER	ADP-60RH A	0508 A 0156123	TOSHIBA	-

\*1) Used for Conducted Emission and Radiated Emission test only.

\*2) Used for Antenna Terminal Conducted test only.

### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	LINE Cable	1.5	Shielded	Shielded	-
2	OPTICAL Cable	1.2	Unshielded	Unshielded	-
3	COAXIAL Cable	2.0	Shielded	Shielded	-
4	Audio Cable (RCA-3.5)	1.5	Shielded	Shielded	-
5	USB Cable	2.0	Shielded	Shielded	-
6	AC Cable	1.5	Unshielded	Shielded	-
7	DC Cable	1.8	Unshielded	Shielded	-
8	AC Cable	1.9	Unshielded	Unshielded	-

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## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8m above the conducting ground plane.

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

**Detector** : QP and CISPR AV  
**Measurement range** : 0.15 MHz - 30 MHz  
**Test data** : APPENDIX  
**Test result** : Pass

## **SECTION 6: Radiated Spurious Emission**

### **Test Procedure**

[For below 1GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

### **Test Antennas are used as below;**

Frequency	30 MHz to 300 MHz	300 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

### **20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).**

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 10 Hz *1)	RBW: 100 kHz VBW: 300 kHz
Test Distance	3 m	4 m *2) (below 10 GHz), 1 m *3) (above 10 GHz), 0.5 m *4) (above 26.5 GHz)		4 m *2) (below 10 GHz), 1 m *3) (above 10 GHz), 0.5 m *4) (above 26.5 GHz)

\*1) Although DA 00-705 accepts VBW = 10 Hz for AV measurements, it was confirmed that superfluous smoothing was not performed.

\*2) Distance Factor:  $20 \times \log(4.0 \text{ m} / 3.0 \text{ m}) = 2.5 \text{ dB}$

\*3) Distance Factor:  $20 \times \log(1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$

\*4) Distance Factor:  $20 \times \log(0.5 \text{ m} / 3.0 \text{ m}) = -15.6 \text{ dB}$

The test was made on EUT at the normal use position.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

**Measurement range** : 30 M - 26.5 GHz  
**Test data** : APPENDIX  
**Test result** : Pass

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## **SECTION 7: Antenna Terminal Conducted Tests**

### **Test Procedure**

The tests were made with below setting connected to the antenna port.

<b>Test</b>	<b>Span</b>	<b>RBW</b>	<b>VBW</b>	<b>Sweep time</b>	<b>Detector</b>	<b>Trace</b>	<b>Instrument used</b>
20dB Bandwidth	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak Average *3)	-	Power Meter (Sensor: 50MHz BW)
Carrier Frequency Separation	3 MHz	30 kHz	100 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	300 kHz	1 MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *2)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	9.1 kHz	27 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
*1) Peak hold was applied as Worst-case measurement. *2) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart. *3) Reference data							

The test results and limit are rounded off to two decimals place, so some differences might be observed.

**Test data** : APPENDIX  
**Test result** : Pass

**APPENDIX 1: Test data**

**Conducted Emission**

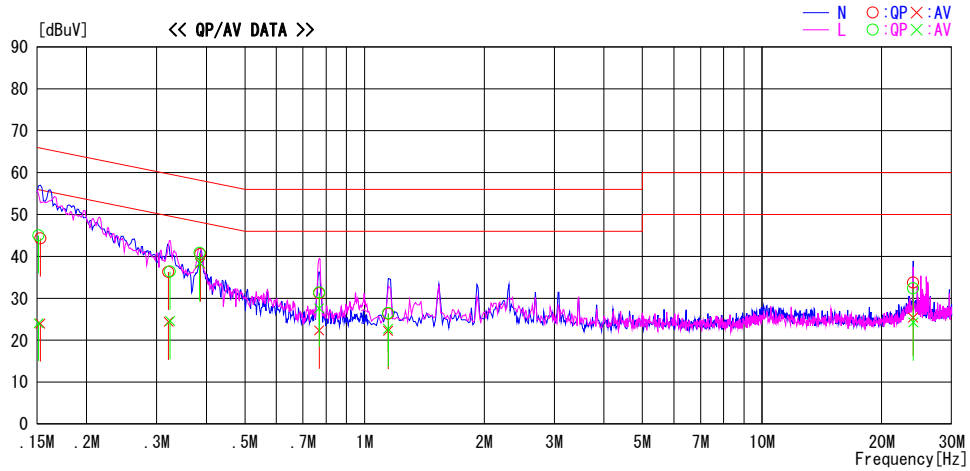
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2016/02/08

Report No. : 11138084H  
Temp./Humi. : 21deg. C / 31% RH  
Engineer : Ken Fujita

Mode / Remarks : DH5 2402 MHz SOUNDBAR

LIMIT : FCC15.207 QP  
FCC15.207 AV

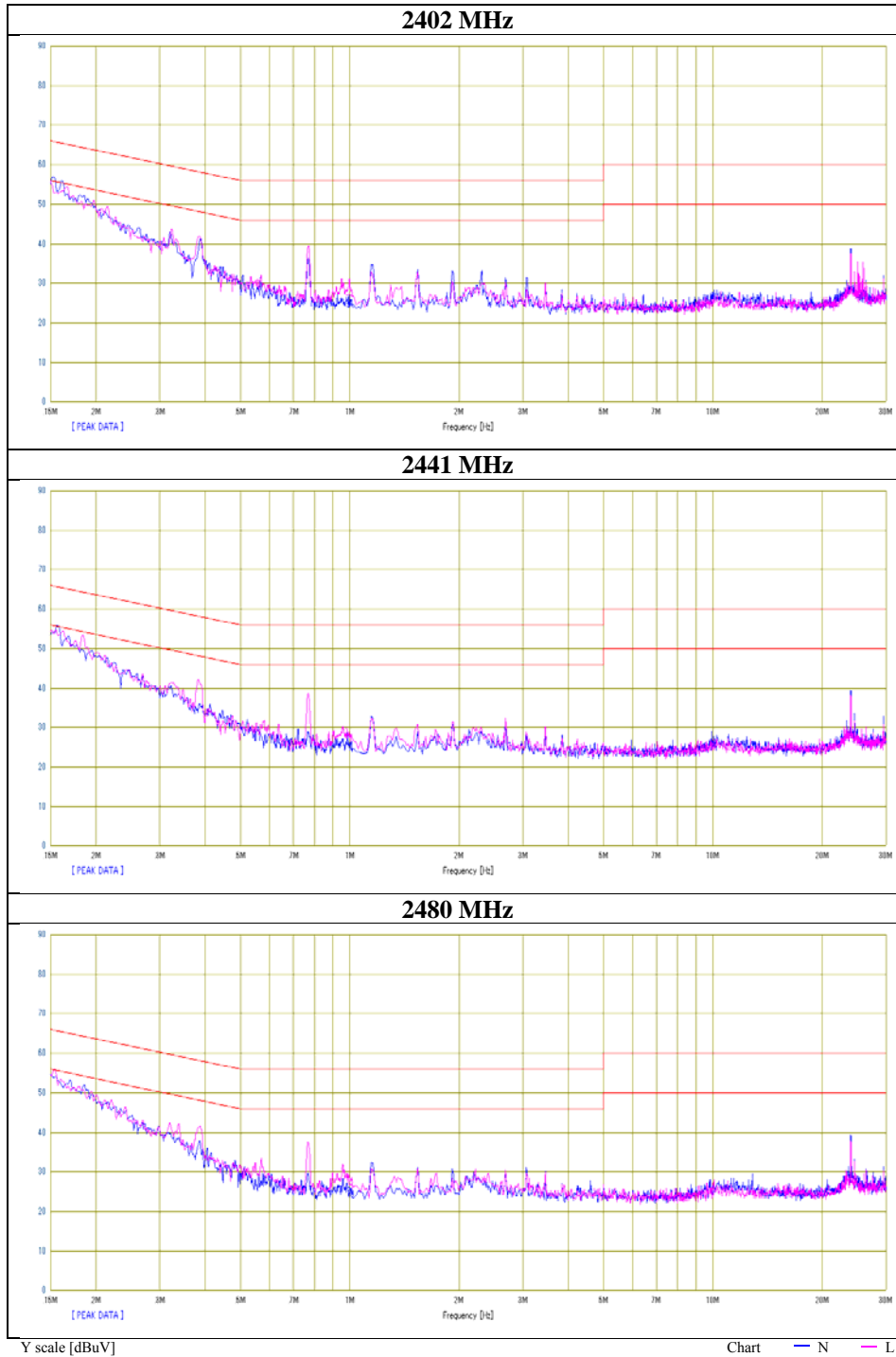


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15290	31.1	10.8	13.2	44.3	24.0	65.8	55.8	21.5	31.8	N	
0.32110	23.0	11.1	13.3	36.3	24.4	59.7	49.7	23.4	25.3	N	
0.38635	27.3	25.0	13.3	40.6	38.3	58.1	48.1	17.5	9.8	N	
0.76915	17.8	8.9	13.4	31.2	22.3	56.0	46.0	24.8	23.7	N	
1.14628	12.8	8.7	13.5	26.3	22.2	56.0	46.0	29.7	23.8	N	
23.98503	19.1	10.8	14.6	33.7	25.4	60.0	50.0	26.3	24.6	N	
0.15145	31.8	10.9	13.2	45.0	24.1	65.9	55.9	20.9	31.8	L	
0.32400	23.1	11.3	13.3	36.4	24.6	59.6	49.6	23.2	25.0	L	
0.38490	27.5	25.1	13.3	40.8	38.4	58.2	48.2	17.4	9.8	L	
0.76915	18.0	14.2	13.4	31.4	27.6	56.0	46.0	24.6	18.4	L	
1.14628	13.0	9.2	13.5	26.5	22.7	56.0	46.0	29.5	23.3	L	
24.01845	17.8	9.6	14.6	32.4	24.2	60.0	50.0	27.6	25.8	L	

CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATTEN. + CABLE)  
Except for the above table : adequate margin data below the limits.

## Conducted Emission

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11138084H
Date	February 8, 2016
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Ken Fujita
Mode	Tx DH5



## Conducted Emission

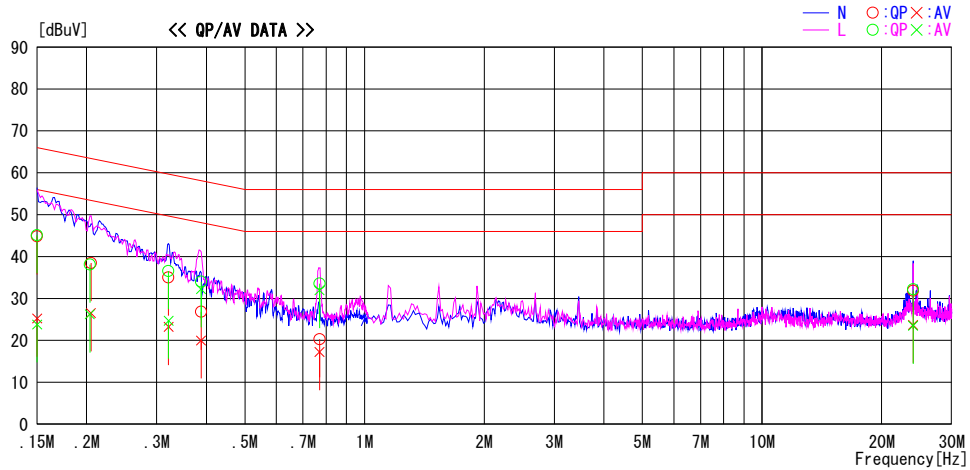
### DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2016/02/08

Report No. : 11138084H  
Temp./Humi. : 21deg. C / 31% RH  
Engineer : Ken Fujita

Mode / Remarks : 3DH5 2402 MHz SOUNDBAR

LIMIT : FCC15.207 QP  
FCC15.207 AV

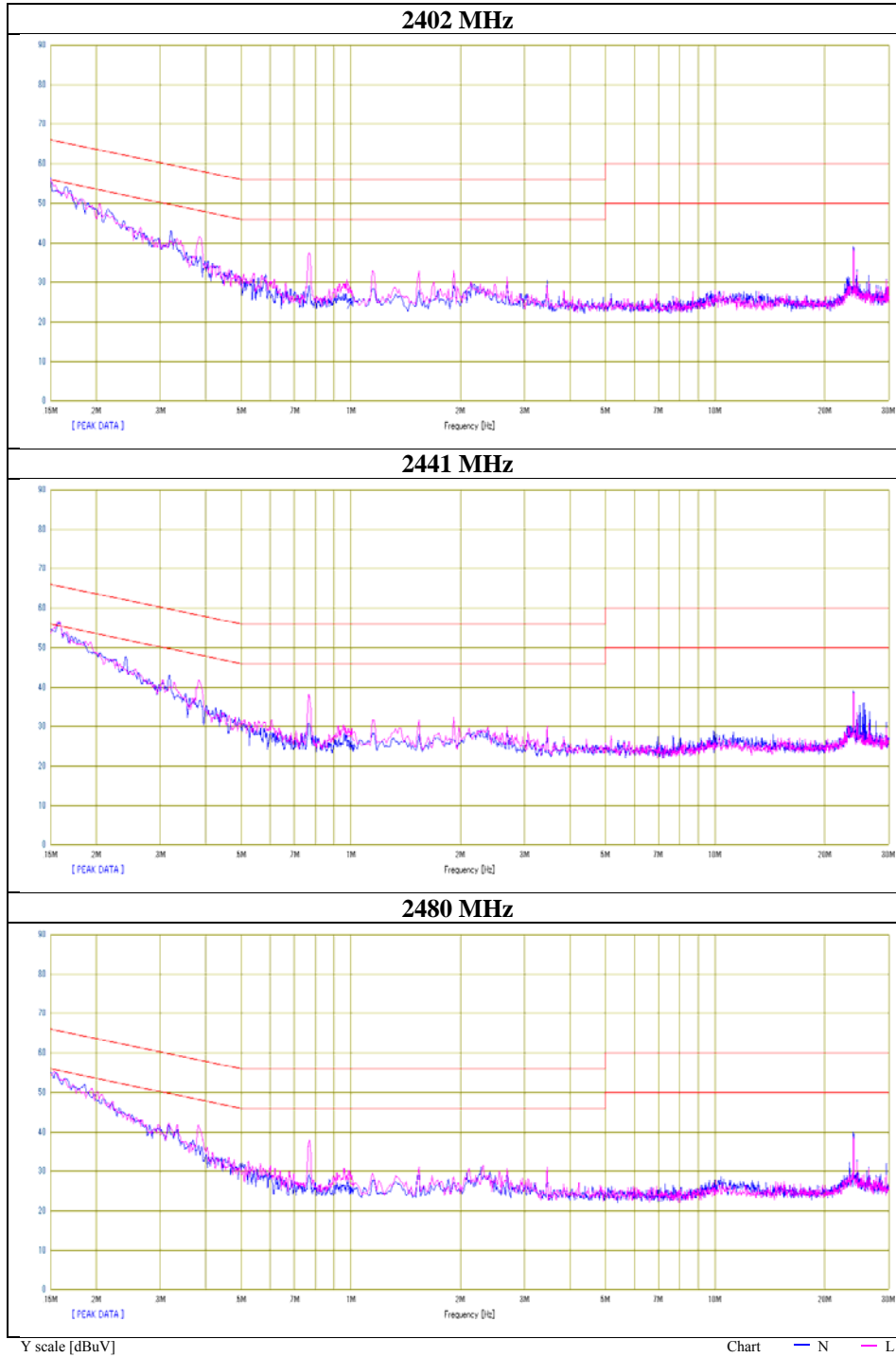


Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	31.6	12.0	13.2	44.8	25.2	66.0	56.0	21.2	30.8	N	
0.20510	25.3	13.3	13.2	38.5	26.5	63.4	53.4	24.9	26.9	N	
0.32110	21.7	9.9	13.3	35.0	23.2	59.7	49.7	24.7	26.5	N	
0.38780	13.5	6.7	13.3	26.8	20.0	58.1	48.1	31.3	28.1	N	
0.77060	6.9	3.8	13.4	20.3	17.2	56.0	46.0	35.7	28.8	N	
23.98503	17.2	9.1	14.6	31.8	23.7	60.0	50.0	28.2	26.3	N	
0.15000	31.9	10.6	13.2	45.1	23.8	66.0	56.0	20.9	32.2	L	
0.20365	24.9	13.0	13.2	38.1	26.2	63.5	53.5	25.4	27.3	L	
0.32110	23.3	11.4	13.3	36.6	24.7	59.7	49.7	23.1	25.0	L	
0.38780	20.7	18.9	13.3	34.0	32.2	58.1	48.1	24.1	15.9	L	
0.77060	20.2	18.6	13.4	33.6	32.0	56.0	46.0	22.4	14.0	L	
23.98503	17.6	8.9	14.6	32.2	23.5	60.0	50.0	27.8	26.5	L	

CHART : WITH FACTOR. Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + ATTEN. + CABLE)  
Except for the above table : adequate margin data below the limits.

## Conducted Emission

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 11138084H  
Date : February 8, 2016  
Temperature / Humidity : 21 deg. C / 31 % RH  
Engineer : Ken Fujita  
Mode : Tx 3DH5





## 20dB Bandwidth and Carrier Frequency Separation

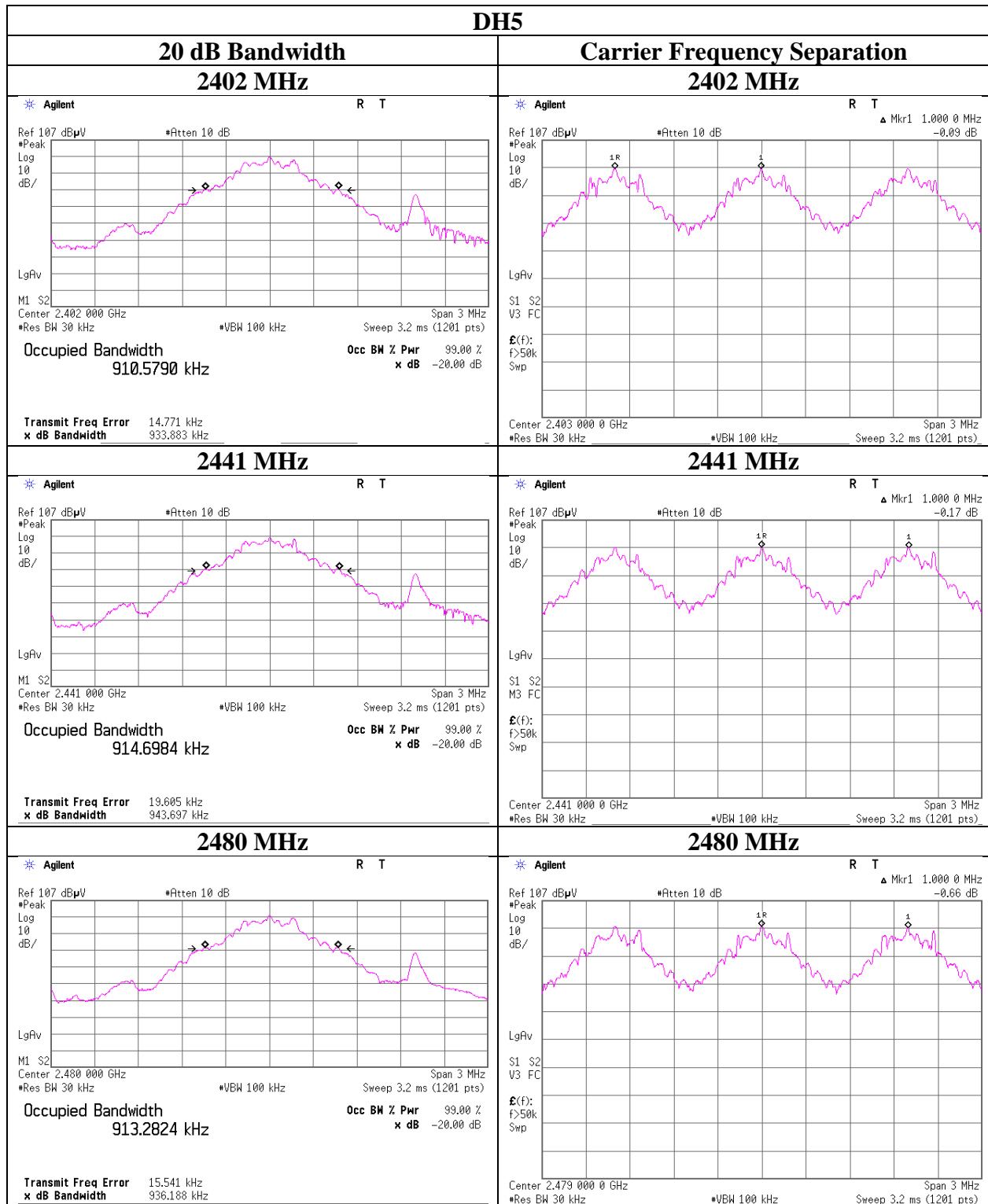
Test place Ise EMC Lab. No.7 Shielded Room  
Report No. 11138084H  
Date February 10, 2016  
Temperature / Humidity 21 deg. C / 22 % RH  
Engineer Yutaka Yoshida  
Mode Tx Hopping On/Off

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.934	1.000	$\geq 0.623$
DH5	2441.0	0.944	1.000	$\geq 0.629$
DH5	2480.0	0.936	1.000	$\geq 0.624$
3DH5	2402.0	1.261	1.000	$\geq 0.841$
3DH5	2441.0	1.261	1.000	$\geq 0.841$
3DH5	2480.0	1.264	1.000	$\geq 0.843$

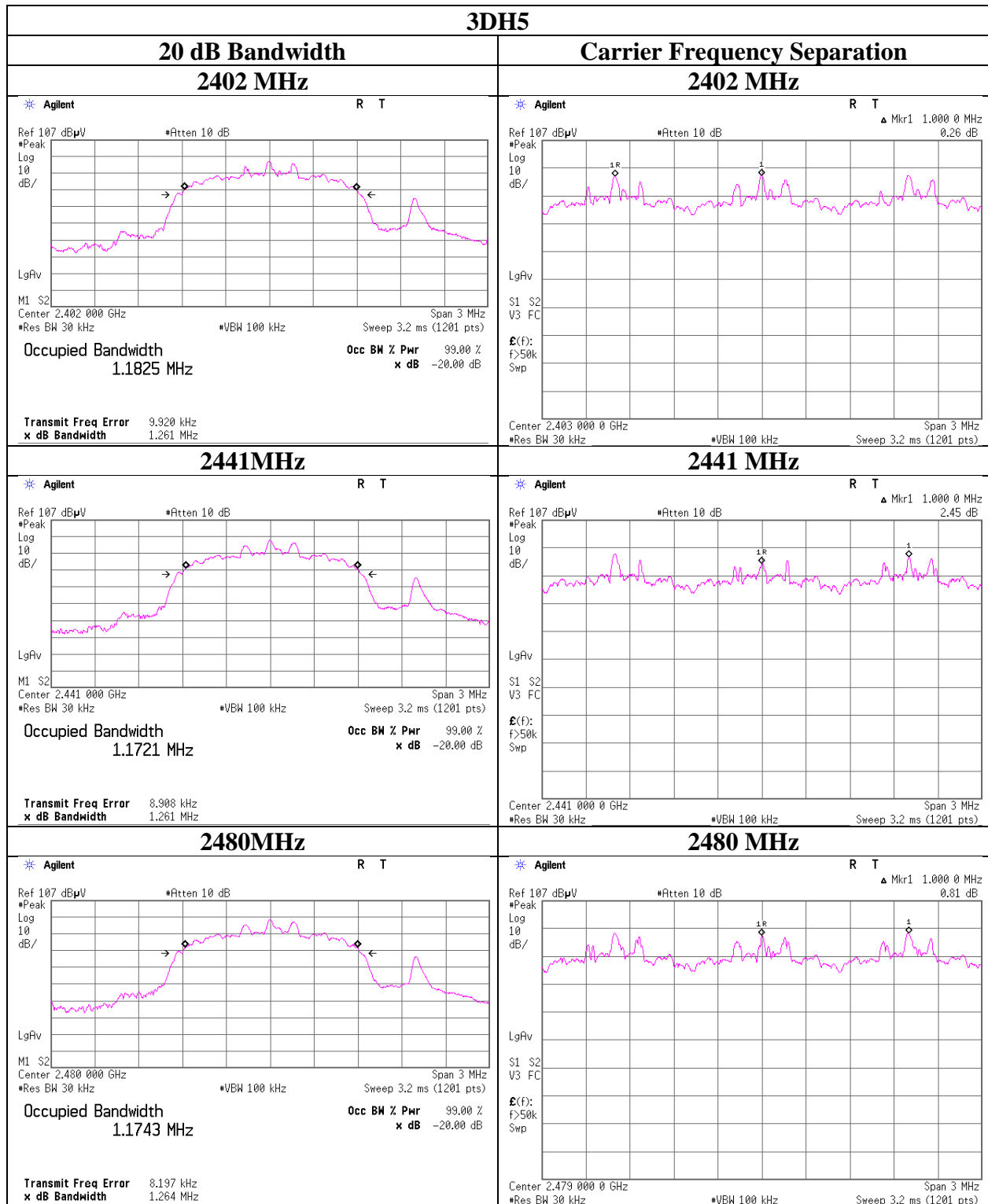
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

**20dB Bandwidth and Carrier Frequency Separation**



## 20dB Bandwidth and Carrier Frequency Separation



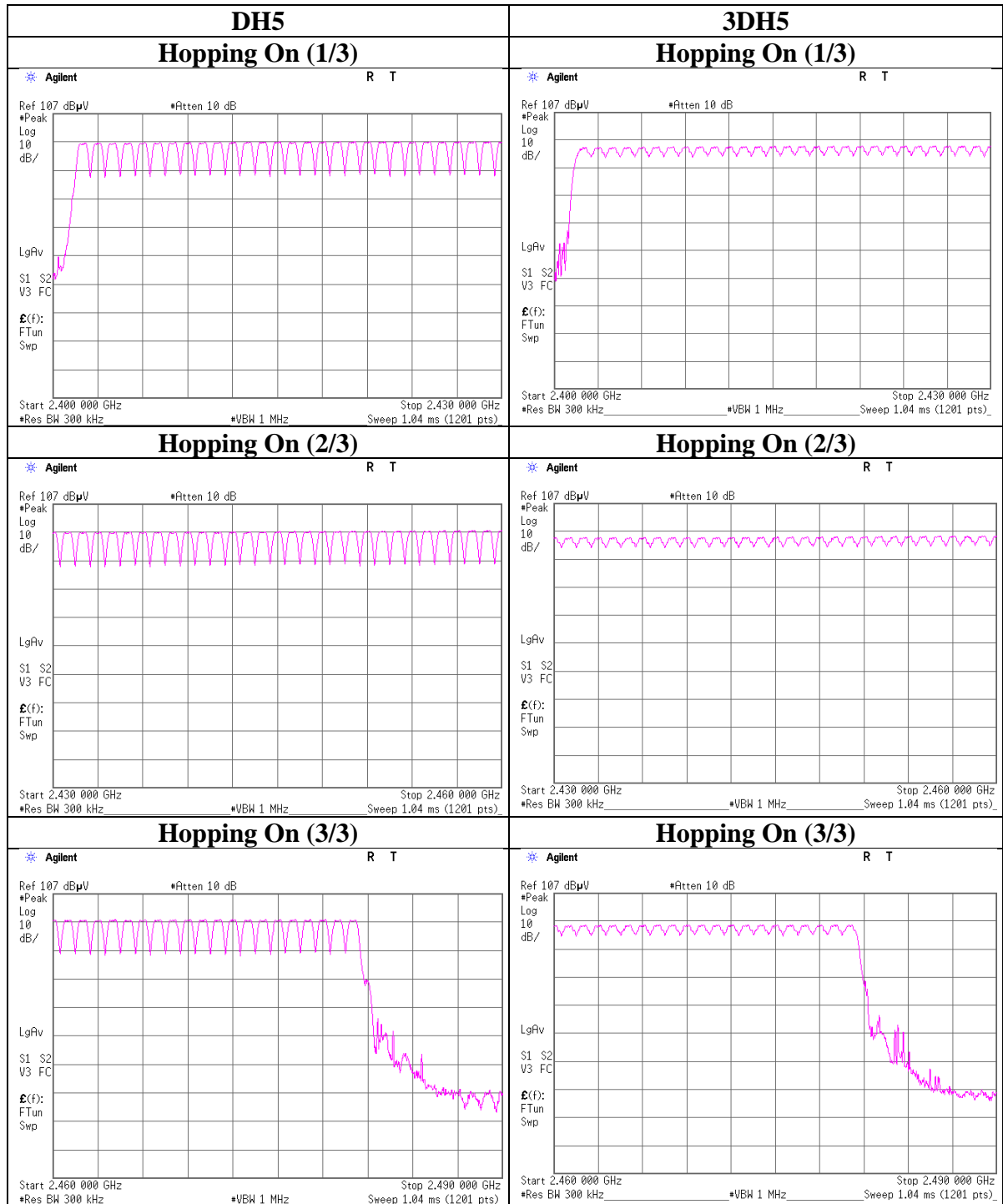
### Number of Hopping Frequency

Test place Ise EMC Lab. No.7 Shielded Room  
Report No. 11138084H  
Date February 10, 2016  
Temperature / Humidity 21 deg. C / 22 % RH  
Engineer Yutaka Yoshida  
Mode Tx Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	$\geq 15$
3DH5	79	$\geq 15$

Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.

### Number of Hopping Frequency



### Dwell time

Test place Ise EMC Lab. No.7 Shielded Room  
Report No. 11138084H  
Date February 10, 2016  
Temperature / Humidity 21 deg. C / 22 % RH  
Engineer Yutaka Yoshida  
Mode Tx Hopping On

Mode	Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission [msec]	Result [msec]	Limit [msec]
DH1	51.0 times / 5 sec. x 31.6 sec. = 323 times	0.440	142	400
DH3	26.0 times / 5 sec. x 31.6 sec. = 165 times	1.705	281	400
DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.953	319	400
3DH1	51.0 times / 5 sec. x 31.6 sec. = 323 times	0.438	141	400
3DH3	26.0 times / 5 sec. x 31.6 sec. = 165 times	1.692	279	400
3DH5	17.0 times / 5 sec. x 31.6 sec. = 108 times	2.948	318	400

Sample Calculation

Result = Number of transmission x Length of transmission

This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in  $N \times 0.4s$ , where  $N$  is the number of channels being used in the hopping sequence ( $20 \leq N \leq 79$ ), is always less than  $0.4s$  regardless of packet size. This is confirmed in the test report for  $N = 79$ .

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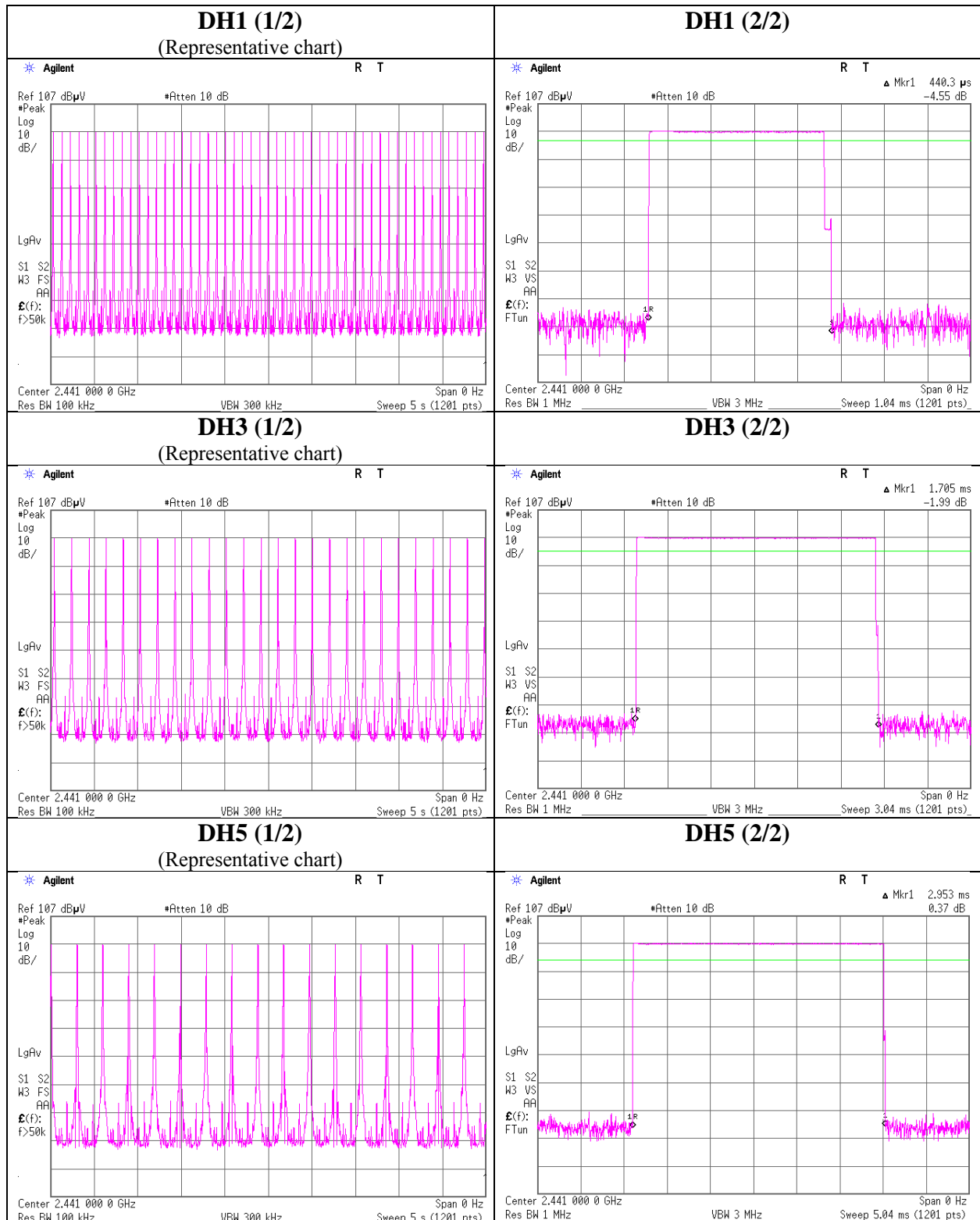
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Facsimile : +81 596 24 8124

**Dwell time**



**UL Japan, Inc.**

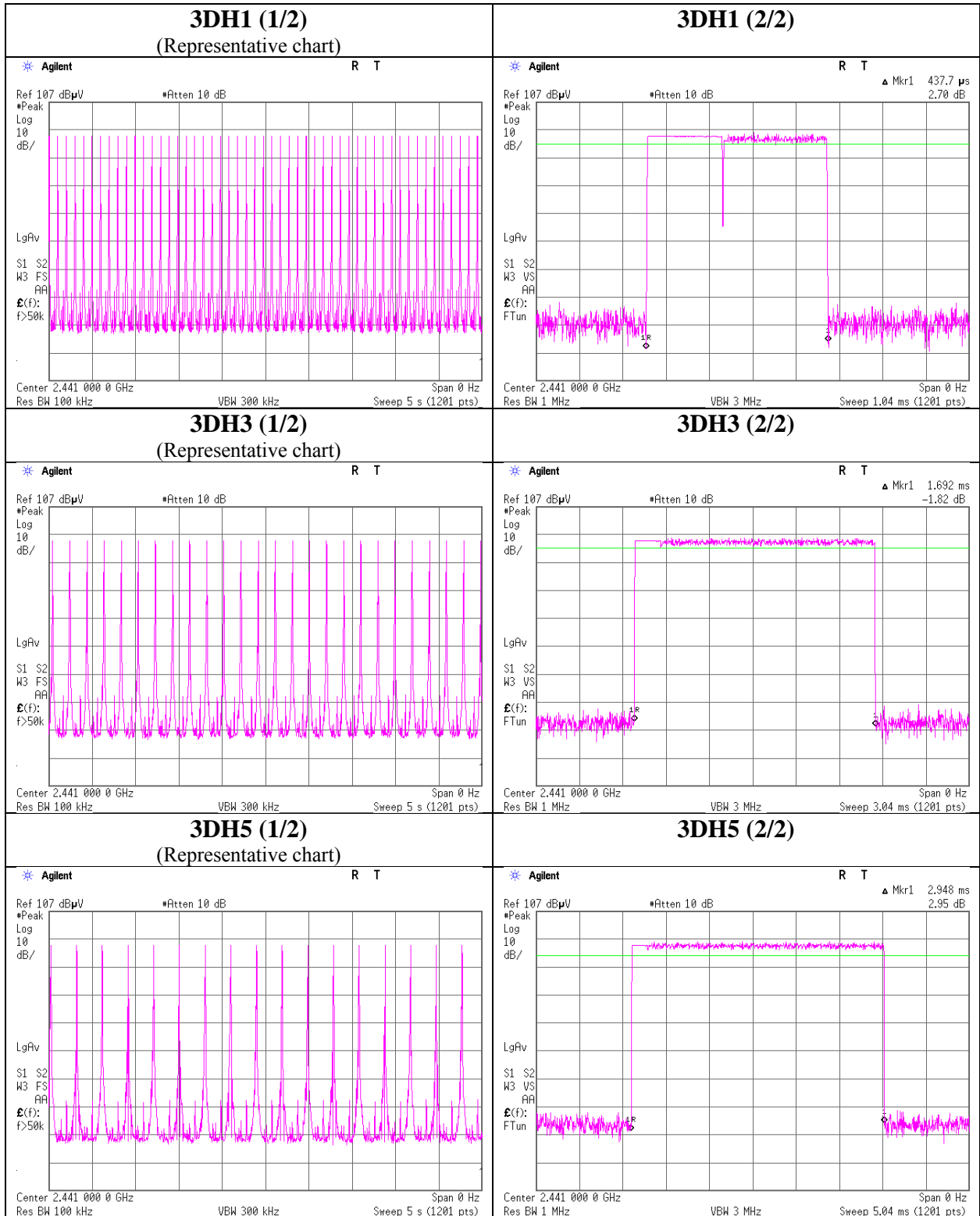
**Ise EMC Lab.**

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**Dwell time**



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## Maximum Peak Output Power

Test place : Ise EMC Lab. No.7 Sheilded Room  
Report No. : 11138084H  
Date : February 10, 2016  
Temperature / Humidity : 21 deg. C / 22 % RH  
Engineer : Yutaka Yoshida  
Mode : Tx Hopping Off

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-9.55	3.33	10.02	3.81	2.40	20.96	125	17.15
DH5	2441.0	-9.31	3.34	10.02	4.06	2.54	20.96	125	16.90
DH5	2480.0	-8.69	3.35	10.02	4.69	2.94	20.96	125	16.27
2DH5	2402.0	-10.90	3.33	10.02	2.46	1.76	20.96	125	18.50
2DH5	2441.0	-10.44	3.34	10.02	2.93	1.96	20.96	125	18.03
2DH5	2480.0	-9.73	3.35	10.02	3.65	2.32	20.96	125	17.31
3DH5	2402.0	-10.59	3.33	10.02	2.77	1.89	20.96	125	18.19
3DH5	2441.0	-10.06	3.34	10.02	3.31	2.14	20.96	125	17.65
3DH5	2480.0	-9.41	3.35	10.02	3.97	2.49	20.96	125	16.99

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.

As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

**Average Output Power**  
**(Reference data for RF Exposure)**

Test place : Ise EMC Lab. No.7 Shielded Room  
Report No. : 11138084H  
Date : February 10, 2016  
Temperature / Humidity : 21 deg. C / 22 % RH  
Engineer : Yutaka Yoshida  
Mode : Tx Hopping Off

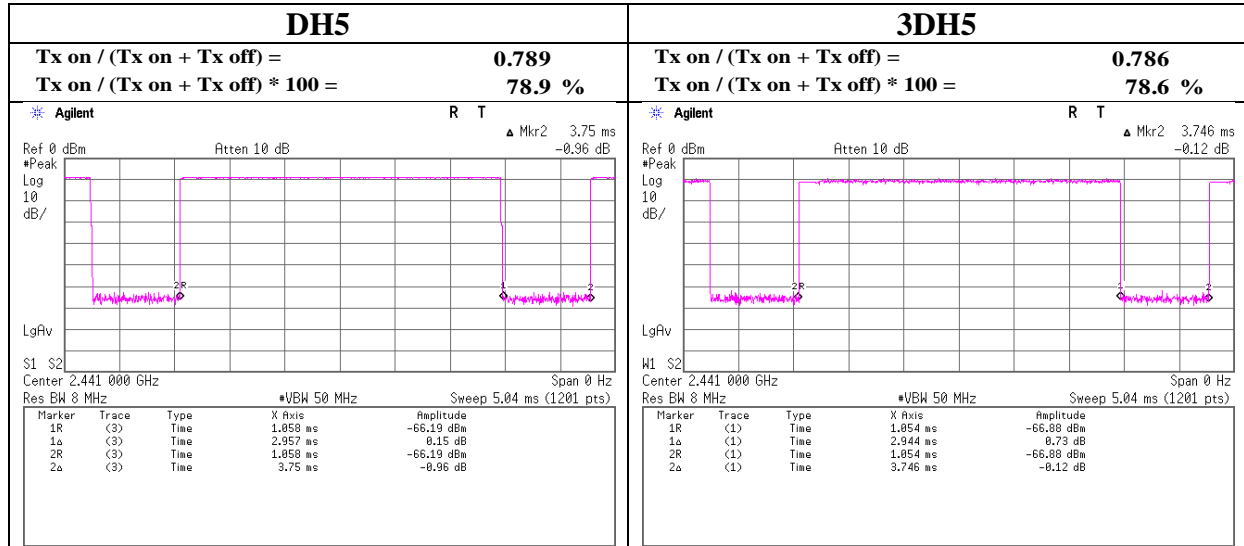
Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result	
					[dBm]	[mW]
DH5	2402.0	-11.71	3.33	10.02	1.65	1.46
DH5	2441.0	-11.23	3.34	10.02	2.14	1.64
DH5	2480.0	-10.55	3.35	10.02	2.83	1.92
2DH5	2402.0	-15.27	3.33	10.02	-1.91	0.64
2DH5	2441.0	-14.72	3.34	10.02	-1.35	0.73
2DH5	2480.0	-13.97	3.35	10.02	-0.59	0.87
3DH5	2402.0	-15.25	3.33	10.02	-1.89	0.65
3DH5	2441.0	-14.71	3.34	10.02	-1.34	0.73
3DH5	2480.0	-13.96	3.35	10.02	-0.58	0.87

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

### Burst Rate Confirmation

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11138084H
Date	February 10, 2016
Temperature / Humidity	21 deg. C / 22 % RH
Engineer	Yutaka Yoshida
Mode	Tx Hopping Off



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## Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.3
Report No.	11138084H	No.3
Date	February 5, 2016	February 6, 2016
Temperature / Humidity	18 deg. C / 31 % RH	20 deg. C / 30 % RH
Engineer	Takafumi Noguchi	Takafumi Noguchi
	(Below 1 GHz)	(1 GHz – 10 GHz)
Mode	Tx DH5 2402 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	104.423	QP	42.5	10.6	8.1	32.1	29.1	43.5	14.4	
Hori	119.986	QP	35.4	12.8	8.3	32.0	24.5	43.5	19.0	
Hori	153.893	QP	43.5	15.1	8.7	31.9	35.4	43.5	8.1	
Hori	196.590	QP	42.7	16.3	9.1	31.8	36.3	43.5	7.2	
Hori	294.890	QP	32.7	19.5	9.9	31.8	30.3	46.0	15.7	
Hori	959.998	QP	28.9	25.9	13.6	30.9	37.5	46.0	8.5	
Hori	2390.000	PK	45.9	26.9	5.8	32.0	46.6	73.9	27.3	
Hori	4804.000	PK	41.1	31.8	8.0	31.3	49.6	73.9	24.3	Floor Noise
Hori	7206.000	PK	41.8	36.0	9.2	32.0	55.0	73.9	18.9	Floor Noise
Hori	9608.000	PK	42.6	38.2	10.0	32.4	58.4	73.9	15.5	Floor Noise
Hori	2390.000	AV	33.2	26.9	5.8	32.0	33.9	53.9	20.0	
Hori	4804.000	AV	29.1	31.8	8.0	31.3	37.6	53.9	16.3	Floor Noise
Hori	7206.000	AV	30.7	36.0	9.2	32.0	43.9	53.9	10.0	Floor Noise
Hori	9608.000	AV	30.7	38.2	10.0	32.4	46.5	53.9	7.4	Floor Noise
Vert	42.435	QP	44.2	13.4	7.3	32.1	32.8	40.0	7.2	
Vert	75.979	QP	52.4	6.4	7.8	32.0	34.6	40.0	5.4	
Vert	104.308	QP	49.2	10.6	8.1	32.1	35.8	43.5	7.7	
Vert	154.950	QP	48.1	15.1	8.7	31.9	40.0	43.5	3.5	
Vert	196.583	QP	43.4	16.3	9.1	31.8	37.0	43.5	6.6	
Vert	960.001	QP	26.7	25.9	13.6	30.9	35.3	53.9	18.6	
Vert	2390.000	PK	47.6	26.9	5.8	32.0	48.3	73.9	25.6	
Vert	4804.000	PK	40.8	31.8	8.0	31.3	49.3	73.9	24.6	Floor Noise
Vert	7206.000	PK	41.9	36.0	9.2	32.0	55.1	73.9	18.8	Floor Noise
Vert	9608.000	PK	42.8	38.2	10.0	32.4	58.6	73.9	15.3	Floor Noise
Vert	2390.000	AV	35.3	26.9	5.8	32.0	36.0	53.9	17.9	
Vert	4804.000	AV	29.1	31.8	8.0	31.3	37.6	53.9	16.3	Floor Noise
Vert	7206.000	AV	30.8	36.0	9.2	32.0	44.0	53.9	9.9	Floor Noise
Vert	9608.000	AV	30.7	38.2	10.0	32.4	46.5	53.9	7.4	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

\*These results have sufficient margin without taking account Dwell time factor.

Distance factor: 1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB  
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB  
26.5 GHz - 40 GHz 20log (0.5 m / 3.0 m) = -15.6 dB

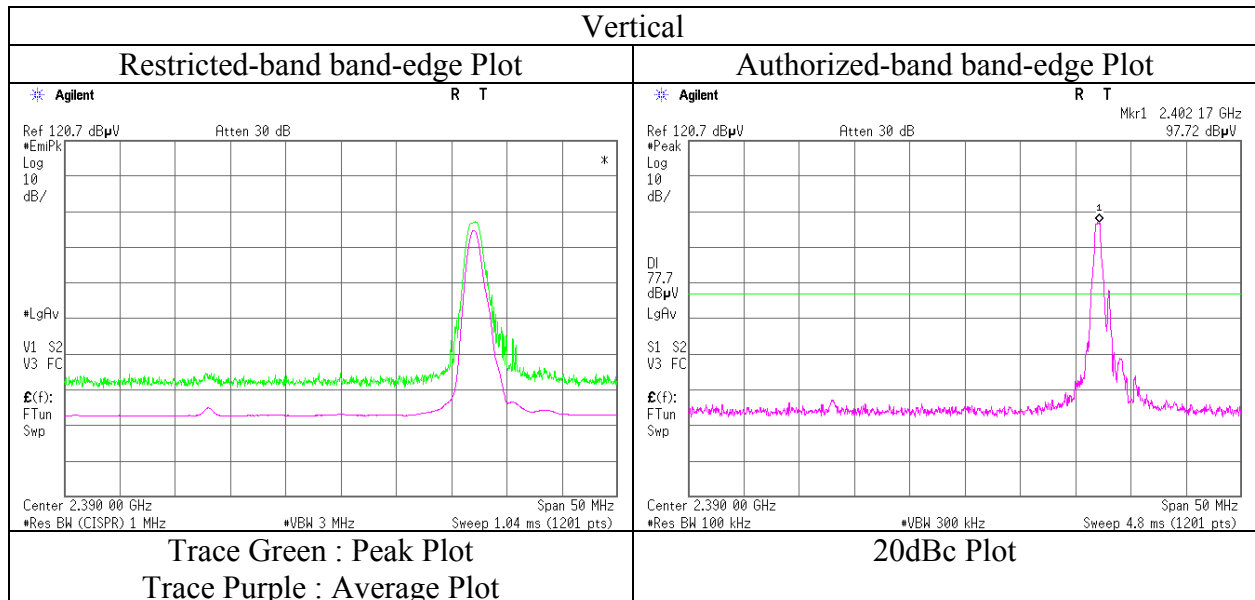
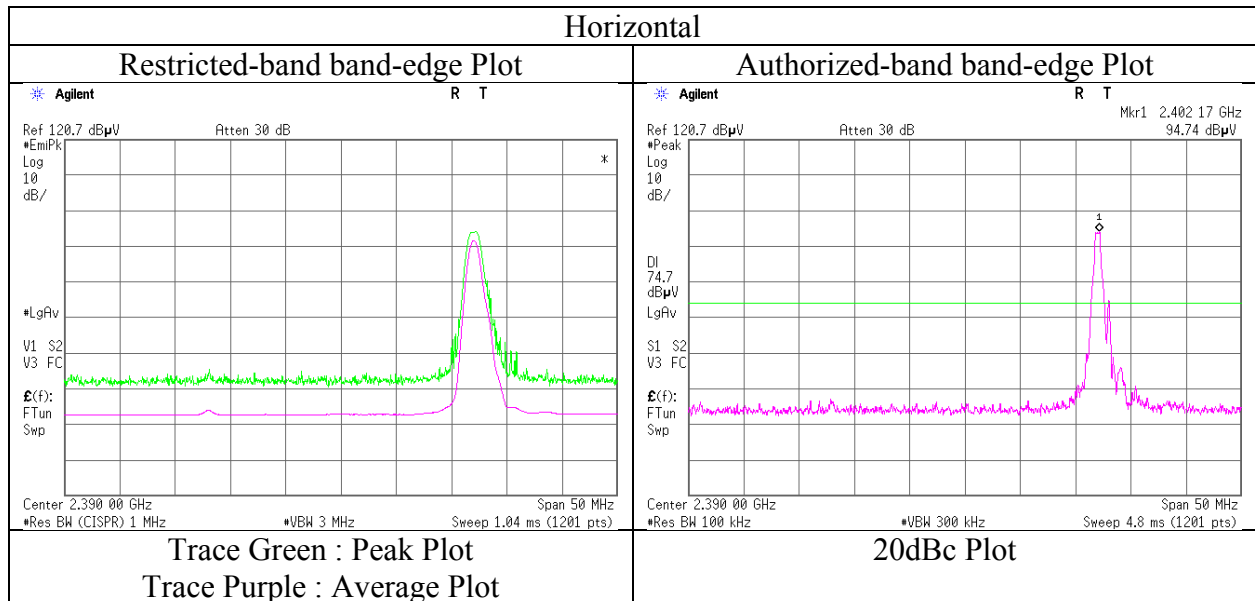
### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	94.7	26.9	5.8	32.0	95.4	-	-	Carrier
Hori	2400.000	PK	49.0	26.9	5.8	32.0	49.7	75.4	25.7	
Vert	2402.000	PK	97.7	26.9	5.8	32.0	98.4	-	-	Carrier
Vert	2400.000	PK	51.7	26.9	5.8	32.0	52.4	78.4	26.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

**Radiated Spurious Emission  
(Reference Plot for band-edge)**

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11138084H
Date	February 6, 2016
Temperature / Humidity	20 deg. C / 30 % RH
Engineer	Takafumi Noguchi
	(1 GHz – 10 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



\* Final result of restricted band edge was shown in tabular data.

## Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.3	No.3
Report No.	11138084H		
Date	February 5, 2016	February 6, 2016	February 7, 2016
Temperature / Humidity	18 deg. C / 31 % RH	20 deg. C / 30 % RH	22 deg. C / 32 % RH
Engineer	Takafumi Noguchi (Below 1 GHz)	Takafumi Noguchi (1 GHz – 10 GHz)	Ken Fujita (Above 10 GHz)
Mode	Tx DH5 2441 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	106.502	QP	43.6	10.9	8.2	32.1	30.6	43.5	12.9	
Hori	119.983	QP	39.0	12.8	8.3	32.0	28.1	43.5	15.4	
Hori	154.869	QP	45.1	15.1	8.7	31.9	37.0	43.5	6.5	
Hori	196.590	QP	43.3	16.3	9.1	31.8	36.9	43.5	6.6	
Hori	294.912	QP	32.1	19.5	9.9	31.8	29.7	46.0	16.3	
Hori	959.996	QP	30.5	25.9	13.6	30.9	39.1	46.0	6.9	
Hori	4882.000	PK	41.2	31.9	8.0	31.3	49.8	73.9	24.1	Floor Noise
Hori	7323.000	PK	42.0	36.0	9.3	32.0	55.3	73.9	18.6	Floor Noise
Hori	9764.000	PK	42.7	38.2	10.0	32.5	58.4	73.9	15.5	Floor Noise
Hori	4882.000	AV	29.1	31.9	8.0	31.3	37.7	53.9	16.2	Floor Noise
Hori	7323.000	AV	30.7	36.0	9.3	32.0	44.0	53.9	9.9	Floor Noise
Hori	9764.000	AV	30.7	38.2	10.0	32.5	46.4	53.9	7.5	Floor Noise
Vert	42.172	QP	43.3	13.5	7.3	32.1	32.0	40.0	8.0	
Vert	73.706	QP	51.6	6.3	7.8	32.0	33.7	40.0	6.3	
Vert	103.912	QP	49.5	10.6	8.1	32.1	36.1	43.5	7.4	
Vert	153.612	QP	47.4	15.0	8.7	31.9	39.2	43.5	4.3	
Vert	196.585	QP	42.6	16.3	9.1	31.8	36.2	43.5	7.3	
Vert	960.003	QP	33.3	25.9	13.6	30.9	41.9	53.9	12.0	
Vert	4882.000	PK	41.0	31.9	8.0	31.3	49.6	73.9	24.3	Floor Noise
Vert	7323.000	PK	42.0	36.0	9.3	32.0	55.3	73.9	18.6	Floor Noise
Vert	9764.000	PK	42.8	38.2	10.0	32.5	58.5	73.9	15.4	Floor Noise
Vert	4882.000	AV	29.1	31.9	8.0	31.3	37.7	53.9	16.2	Floor Noise
Vert	7323.000	AV	30.8	36.0	9.3	32.0	44.1	53.9	9.8	Floor Noise
Vert	9764.000	AV	30.7	38.2	10.0	32.5	46.4	53.9	7.5	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

\*These results have sufficient margin without taking account Dwell time factor.

Distance factor:  
1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB  
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB  
26.5 GHz - 40 GHz 20log (0.5 m / 3.0 m) = -15.6 dB

## Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.3	No.3
Report No.	11138084H		
Date	February 5, 2016	February 6, 2016	February 7, 2016
Temperature / Humidity	18 deg. C / 31 % RH	20 deg. C / 30 % RH	22 deg. C / 32 % RH
Engineer	Takafumi Noguchi (Below 1 GHz)	Takafumi Noguchi (1 GHz – 10 GHz)	Ken Fujita (Above 10 GHz)
Mode	Tx DH5 2480 MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	106.506	QP	43.5	10.9	8.2	32.1	30.5	43.5	13.0	
Hori	119.985	QP	39.4	12.8	8.3	32.0	28.5	43.5	15.0	
Hori	154.879	QP	45.0	15.1	8.7	31.9	36.9	43.5	6.6	
Hori	196.596	QP	43.2	16.3	9.1	31.8	36.8	43.5	6.7	
Hori	294.912	QP	32.2	19.5	9.9	31.8	29.8	46.0	16.2	
Hori	959.997	QP	30.9	25.9	13.6	30.9	39.5	46.0	6.5	
Hori	2483.500	PK	66.9	26.9	5.8	32.0	67.6	73.9	6.3	
Hori	4960.000	PK	41.1	32.1	7.9	31.2	49.9	73.9	24.0	Floor Noise
Hori	7440.000	PK	44.7	36.0	9.2	32.1	57.8	73.9	16.1	
Hori	9920.000	PK	42.7	38.2	10.1	32.5	58.5	73.9	15.4	Floor Noise
Hori	2483.500	AV	43.9	26.9	5.8	32.0	44.6	53.9	9.3	
Hori	4960.000	AV	29.1	32.1	7.9	31.2	37.9	53.9	16.0	Floor Noise
Hori	7440.000	AV	33.3	36.0	9.2	32.1	46.4	53.9	7.5	
Hori	9920.000	AV	30.7	38.2	10.1	32.5	46.5	53.9	7.4	Floor Noise
Vert	42.798	QP	43.5	13.2	7.3	32.1	31.9	40.0	8.1	
Vert	73.711	QP	51.5	6.3	7.8	32.0	33.6	40.0	6.4	
Vert	104.439	QP	49.5	10.6	8.1	32.1	36.1	43.5	7.4	
Vert	153.998	QP	47.5	15.1	8.7	31.9	39.4	43.5	4.1	
Vert	196.586	QP	42.3	16.3	9.1	31.8	35.9	43.5	7.6	
Vert	960.729	QP	33.9	25.9	13.6	30.9	42.5	53.9	11.4	
Vert	2483.500	PK	69.1	26.9	5.8	32.0	69.8	73.9	4.1	
Vert	4960.000	PK	41.2	32.1	7.9	31.2	50.0	73.9	23.9	Floor Noise
Vert	7440.000	PK	44.3	36.0	9.2	32.1	57.4	73.9	16.5	
Vert	9920.000	PK	42.4	38.2	10.1	32.5	58.2	73.9	15.7	Floor Noise
Vert	2483.500	AV	45.9	26.9	5.8	32.0	46.6	53.9	7.3	
Vert	4960.000	AV	29.2	32.1	7.9	31.2	38.0	53.9	15.9	Floor Noise
Vert	7440.000	AV	33.1	36.0	9.2	32.1	46.2	53.9	7.7	
Vert	9920.000	AV	30.7	38.2	10.1	32.5	46.5	53.9	7.4	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

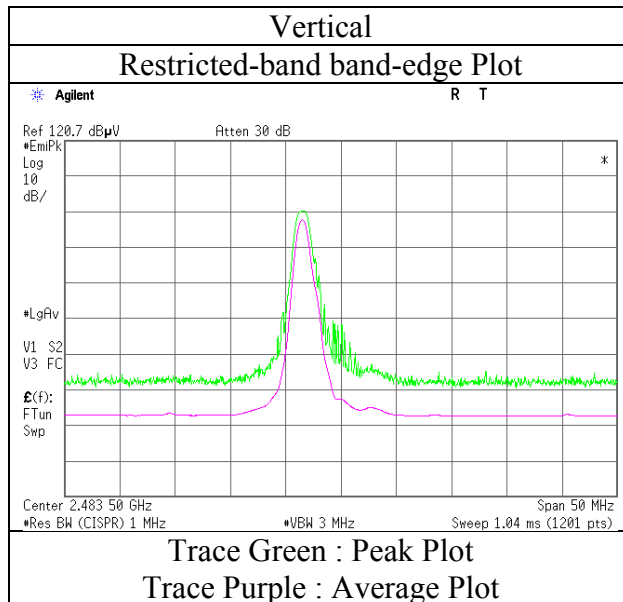
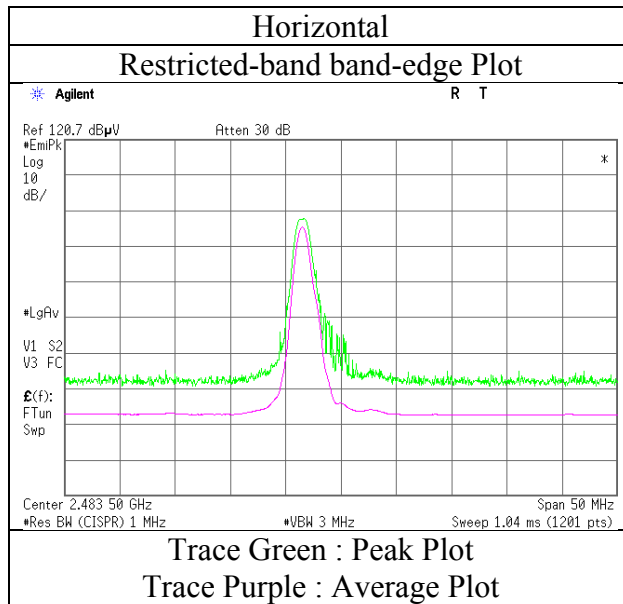
\*The 10th harmonic was not seen so the result was its base noise level.

\*These results have sufficient margin without taking account Dwell time factor.

Distance factor:     1 GHz - 10 GHz   20log (4.0 m / 3.0 m) = 2.5 dB  
                          10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB  
                          26.5 GHz - 40 GHz 20log (0.5 m / 3.0 m) = -15.6 dB

**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 11138084H  
Date February 6, 2016  
Temperature / Humidity 20 deg. C / 30 % RH  
Engineer Takafumi Noguchi  
(1 GHz – 10 GHz)  
Mode Tx, Hopping Off, DH5 2480 MHz

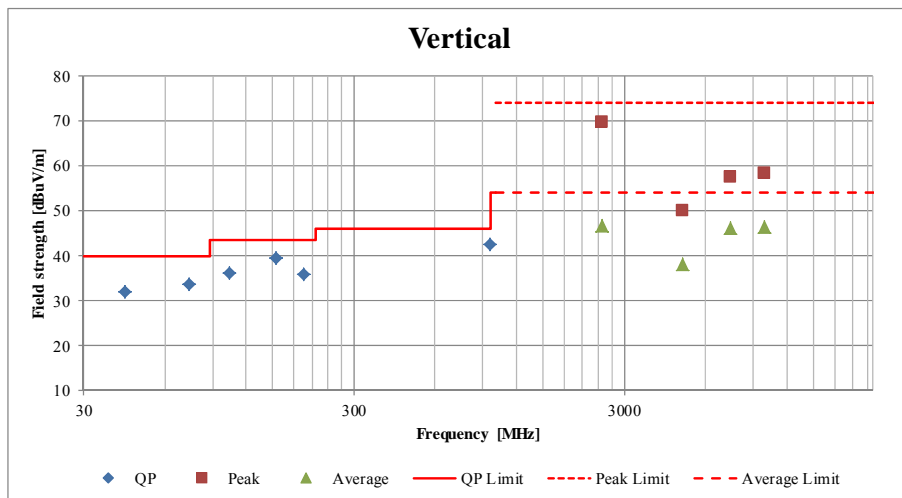
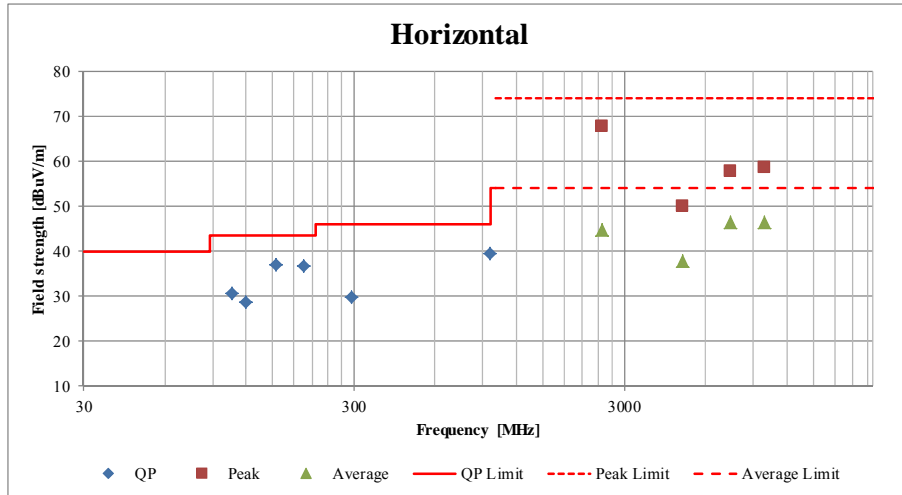


\* Final result of restricted band edge was shown in tabular data.



**Radiated Spurious Emission**  
**(Plot data, Worst case)**

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.3	No.3
Report No.	11138084H		
Date	February 5, 2016	February 6, 2016	February 7, 2016
Temperature / Humidity	18 deg. C / 31 % RH	20 deg. C / 30 % RH	22 deg. C / 32 % RH
Engineer	Takafumi Noguchi (Below 1 GHz)	Takafumi Noguchi (1 GHz – 10 GHz)	Ken Fujita (Above 10 GHz)
Mode	Tx DH5 2480 MHz		



\*These plots data contains sufficient number to show the trend of characteristic features for EUT.

## Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.3
Report No.	11138084H	No.3
Date	February 5, 2016	February 6, 2016
Temperature / Humidity	18 deg. C / 31 % RH	20 deg. C / 30 % RH
Engineer	Takafumi Noguchi	Takafumi Noguchi
	(Below 1 GHz)	(1 GHz – 10 GHz)
Mode	Tx 3DH5 2402 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	105.134	QP	40.6	10.7	8.2	32.1	27.4	43.5	16.1	
Hori	120.000	QP	38.1	12.8	8.3	32.0	27.2	43.5	16.3	
Hori	153.003	QP	43.0	15.0	8.7	31.9	34.8	43.5	8.7	
Hori	196.595	QP	42.5	16.3	9.1	31.8	36.1	43.5	7.4	
Hori	294.894	QP	32.0	19.5	9.9	31.8	29.6	46.0	16.4	
Hori	959.983	QP	28.5	25.9	13.6	30.9	37.1	46.0	8.9	
Hori	2390.000	PK	44.4	26.9	5.8	32.0	45.1	73.9	28.8	
Hori	4804.000	PK	40.7	31.8	8.0	31.3	49.2	73.9	24.7	Floor Noise
Hori	7206.000	PK	42.0	36.0	9.2	32.0	55.2	73.9	18.7	Floor Noise
Hori	9608.000	PK	42.2	38.2	10.0	32.4	58.0	73.9	15.9	Floor Noise
Hori	2390.000	AV	31.3	26.9	5.8	32.0	32.0	53.9	21.9	
Hori	4804.000	AV	29.1	31.8	8.0	31.3	37.6	53.9	16.3	Floor Noise
Hori	7206.000	AV	30.7	36.0	9.2	32.0	43.9	53.9	10.0	Floor Noise
Hori	9608.000	AV	30.9	38.2	10.0	32.4	46.7	53.9	7.2	Floor Noise
Vert	43.181	QP	42.6	13.1	7.3	32.1	30.9	40.0	9.1	
Vert	73.694	QP	51.9	6.3	7.8	32.0	34.0	40.0	6.0	
Vert	104.463	QP	50.1	10.6	8.2	32.1	36.8	43.5	6.7	
Vert	155.730	QP	48.1	15.1	8.7	31.9	40.0	43.5	3.5	
Vert	196.600	QP	41.5	16.3	9.1	31.8	35.1	43.5	8.4	
Vert	960.003	QP	26.9	25.9	13.6	30.9	35.5	53.9	18.4	
Vert	2390.000	PK	46.0	26.9	5.8	32.0	46.7	73.9	27.2	
Vert	4804.000	PK	41.1	31.8	8.0	31.3	49.6	73.9	24.3	Floor Noise
Vert	7206.000	PK	42.0	36.0	9.2	32.0	55.2	73.9	18.7	Floor Noise
Vert	9608.000	PK	42.2	38.2	10.0	32.4	58.0	73.9	15.9	Floor Noise
Vert	2390.000	AV	32.5	26.9	5.8	32.0	33.2	53.9	20.7	
Vert	4804.000	AV	29.1	31.8	8.0	31.3	37.6	53.9	16.3	Floor Noise
Vert	7206.000	AV	30.8	36.0	9.2	32.0	44.0	53.9	9.9	Floor Noise
Vert	9608.000	AV	30.9	38.2	10.0	32.4	46.7	53.9	7.2	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

\*These results have sufficient margin without taking account Dwell time factor.

Distance factor:  
1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB  
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB  
26.5 GHz - 40 GHz 20log (0.5 m / 3.0 m) = -15.6 dB

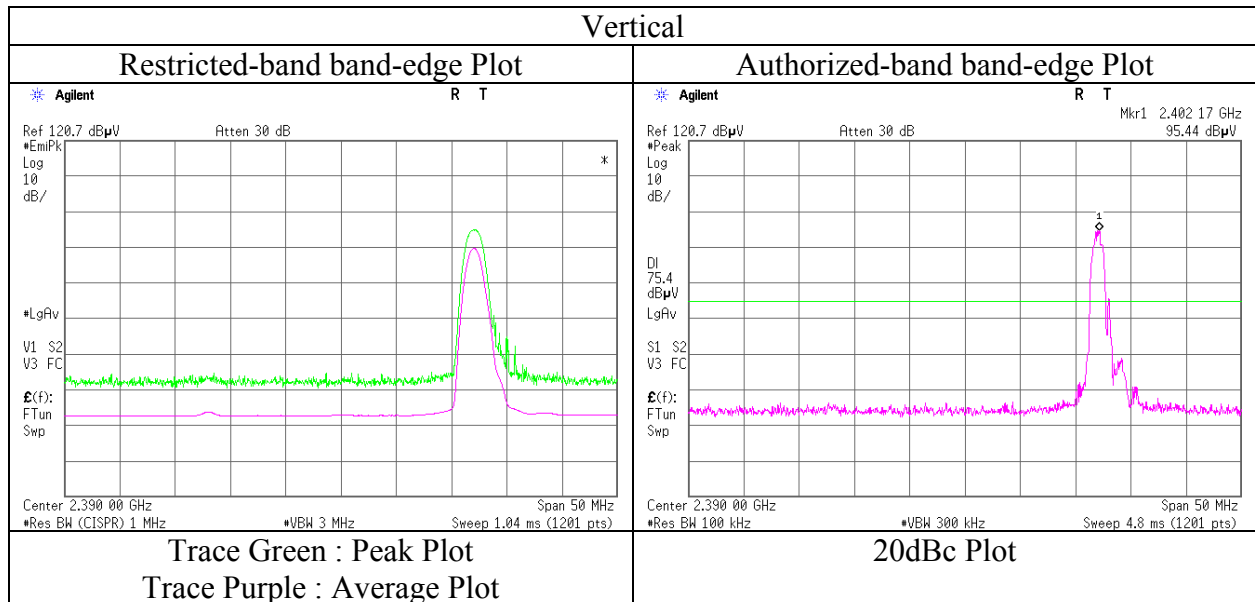
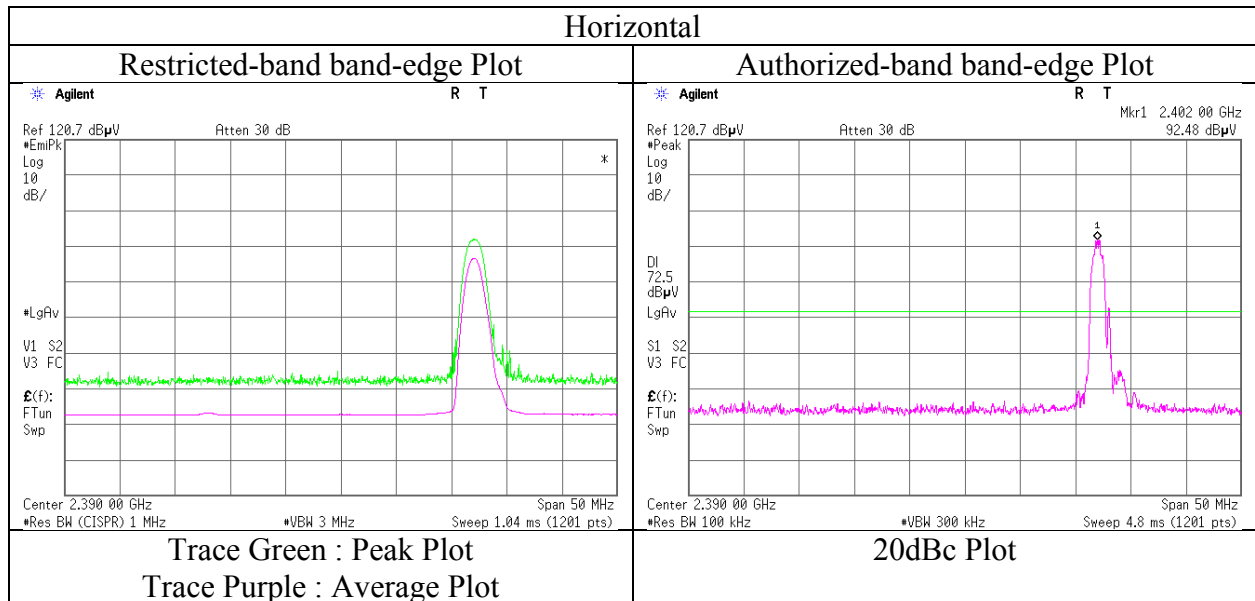
### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2402.000	PK	92.5	26.9	5.8	32.0	93.2	-	-	Carrier
Hori	2400.000	PK	45.4	26.9	5.8	32.0	46.1	73.2	27.1	
Vert	2402.000	PK	95.4	26.9	5.8	32.0	96.1	-	-	Carrier
Vert	2400.000	PK	47.5	26.9	5.8	32.0	48.2	76.1	27.9	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

**Radiated Spurious Emission  
(Reference Plot for band-edge)**

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	11138084H
Date	February 6, 2016
Temperature / Humidity	20 deg. C / 30 % RH
Engineer	Takafumi Noguchi
	(1 GHz – 10 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



\* Final result of restricted band edge was shown in tabular data.

## Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.3
Report No.	11138084H	No.3
Date	February 5, 2016	February 6, 2016
Temperature / Humidity	18 deg. C / 31 % RH	20 deg. C / 30 % RH
Engineer	Takafumi Noguchi	Takafumi Noguchi
	(Below 1 GHz)	(1 GHz – 10 GHz)
Mode	Tx 3DH5 2441 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	106.505	QP	43.7	10.9	8.2	32.1	30.7	43.5	12.8	
Hori	119.989	QP	39.2	12.8	8.3	32.0	28.3	43.5	15.2	
Hori	154.861	QP	45.1	15.1	8.7	31.9	37.0	43.5	6.5	
Hori	196.591	QP	43.5	16.3	9.1	31.8	37.1	43.5	6.4	
Hori	294.910	QP	32.8	19.5	9.9	31.8	30.4	46.0	15.6	
Hori	959.998	QP	30.1	25.9	13.6	30.9	38.7	46.0	7.3	
Hori	4882.000	PK	41.1	31.9	8.0	31.3	49.7	73.9	24.2	Floor Noise
Hori	7323.000	PK	42.3	36.0	9.3	32.0	55.6	73.9	18.3	Floor Noise
Hori	9764.000	PK	42.7	38.2	10.0	32.5	58.4	73.9	15.5	Floor Noise
Hori	4882.000	AV	29.1	31.9	8.0	31.3	37.7	53.9	16.2	Floor Noise
Hori	7323.000	AV	30.6	36.0	9.3	32.0	43.9	53.9	10.0	Floor Noise
Hori	9764.000	AV	30.6	38.2	10.0	32.5	46.3	53.9	7.6	Floor Noise
Vert	42.170	QP	43.1	13.5	7.3	32.1	31.8	40.0	8.2	
Vert	73.710	QP	51.5	6.3	7.8	32.0	33.6	40.0	6.4	
Vert	103.915	QP	49.8	10.6	8.1	32.1	36.4	43.5	7.1	
Vert	153.618	QP	47.1	15.0	8.7	31.9	38.9	43.5	4.6	
Vert	196.589	QP	42.8	16.3	9.1	31.8	36.4	43.5	7.1	
Vert	960.000	QP	33.8	25.9	13.6	30.9	42.4	46.0	3.6	
Vert	4882.000	PK	41.1	31.9	8.0	31.3	49.7	73.9	24.2	Floor Noise
Vert	7323.000	PK	42.0	36.0	9.3	32.0	55.3	73.9	18.6	Floor Noise
Vert	9764.000	PK	42.8	38.2	10.0	32.5	58.5	73.9	15.4	Floor Noise
Vert	4882.000	AV	29.1	31.9	8.0	31.3	37.7	53.9	16.2	Floor Noise
Vert	7323.000	AV	30.8	36.0	9.3	32.0	44.1	53.9	9.8	Floor Noise
Vert	9764.000	AV	30.7	38.2	10.0	32.5	46.4	53.9	7.5	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

\*The 10th harmonic was not seen so the result was its base noise level.

\*These results have sufficient margin without taking account Dwell time factor.

Distance factor:  
1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB  
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB  
26.5 GHz - 40 GHz 20log (0.5 m / 3.0 m) = -15.6 dB

## Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.3
Report No.	11138084H	No.3
Date	February 5, 2016	February 6, 2016
Temperature / Humidity	18 deg. C / 31 % RH	20 deg. C / 30 % RH
Engineer	Takafumi Noguchi	Takafumi Noguchi
	(Below 1 GHz)	(1 GHz – 10 GHz)
Mode	Tx 3DH5 2480 MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	106.510	QP	43.5	10.9	8.2	32.1	30.5	43.5	13.0	
Hori	119.989	QP	39.2	12.8	8.3	32.0	28.3	43.5	15.2	
Hori	154.871	QP	45.0	15.1	8.7	31.9	36.9	43.5	6.6	
Hori	196.595	QP	43.0	16.3	9.1	31.8	36.6	43.5	6.9	
Hori	294.910	QP	32.2	19.5	9.9	31.8	29.8	46.0	16.2	
Hori	959.999	QP	30.5	25.9	13.6	30.9	39.1	46.0	6.9	
Hori	2483.500	PK	65.6	26.9	5.8	32.0	66.3	73.9	7.6	
Hori	4960.000	PK	41.1	32.1	7.9	31.2	49.9	73.9	24.0	Floor Noise
Hori	7440.000	PK	42.4	36.0	9.2	32.1	55.5	73.9	18.4	Floor Noise
Hori	9920.000	PK	42.5	38.2	10.1	32.5	58.3	73.9	15.6	Floor Noise
Hori	2483.500	AV	41.1	26.9	5.8	32.0	41.8	53.9	12.1	
Hori	4960.000	AV	29.1	32.1	7.9	31.2	37.9	53.9	16.0	Floor Noise
Hori	7440.000	AV	30.7	36.0	9.2	32.1	43.8	53.9	10.1	Floor Noise
Hori	9920.000	AV	30.7	38.2	10.1	32.5	46.5	53.9	7.4	Floor Noise
Vert	42.174	QP	43.1	13.5	7.3	32.1	31.8	40.0	8.2	
Vert	73.756	QP	51.8	6.3	7.8	32.0	33.9	40.0	6.1	
Vert	103.915	QP	49.2	10.6	8.1	32.1	35.8	43.5	7.7	
Vert	153.619	QP	47.2	15.0	8.7	31.9	39.0	43.5	4.5	
Vert	196.585	QP	42.4	16.3	9.1	31.8	36.0	43.5	7.5	
Vert	960.005	QP	33.1	25.9	13.6	30.9	41.7	53.9	12.2	
Vert	2483.500	PK	67.9	26.9	5.8	32.0	68.6	73.9	5.3	
Vert	4960.000	PK	40.7	32.1	7.9	31.2	49.5	73.9	24.4	Floor Noise
Vert	7440.000	PK	42.2	36.0	9.2	32.1	55.3	73.9	18.6	Floor Noise
Vert	9920.000	PK	42.3	38.2	10.1	32.5	58.1	73.9	15.8	Floor Noise
Vert	2483.500	AV	43.4	26.9	5.8	32.0	44.1	53.9	9.8	
Vert	4960.000	AV	29.2	32.1	7.9	31.2	38.0	53.9	15.9	Floor Noise
Vert	7440.000	AV	30.8	36.0	9.2	32.1	43.9	53.9	10.0	Floor Noise
Vert	9920.000	AV	30.7	38.2	10.1	32.5	46.5	53.9	7.4	Floor Noise

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

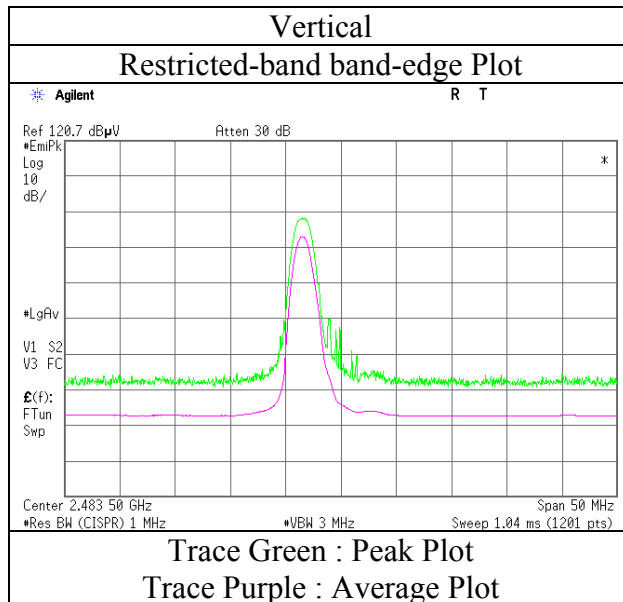
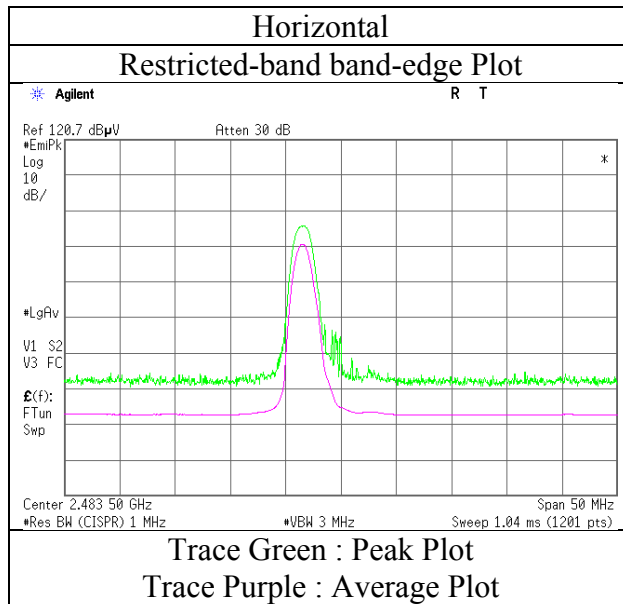
\*The 10th harmonic was not seen so the result was its base noise level.

\*These results have sufficient margin without taking account Dwell time factor.

Distance factor:  
1 GHz - 10 GHz 20log (4.0 m / 3.0 m) = 2.5 dB  
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB  
26.5 GHz - 40 GHz 20log (0.5 m / 3.0 m) = -15.6 dB

**Radiated Spurious Emission**  
**(Reference Plot for band-edge)**

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. 11138084H  
Date February 6, 2016  
Temperature / Humidity 20 deg. C / 30 % RH  
Engineer Takafumi Noguchi  
(1 GHz – 10 GHz)  
Mode Tx, Hopping Off, 3DH5 2480 MHz

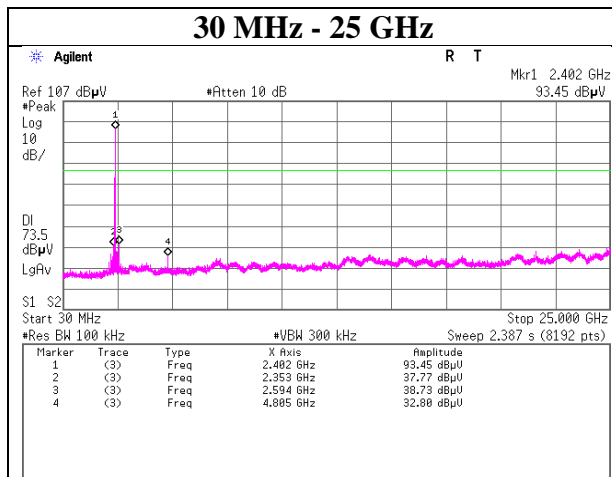
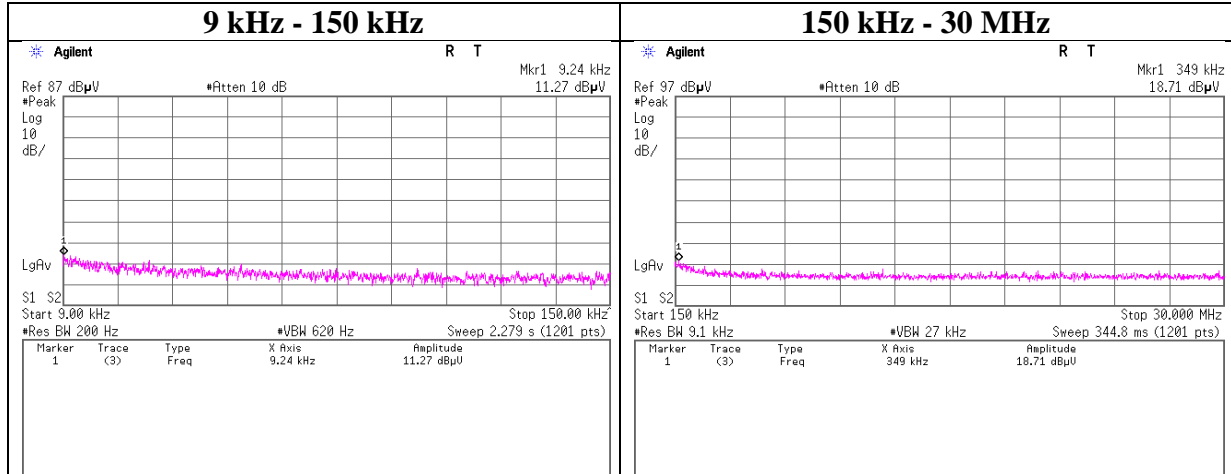


\* Final result of restricted band edge was shown in tabular data.

### Conducted Spurious Emission

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11138084H
Date	February 10, 2016
Temperature / Humidity	21 deg. C / 22 % RH
Engineer	Yutaka Yoshida
Mode	Tx DH5

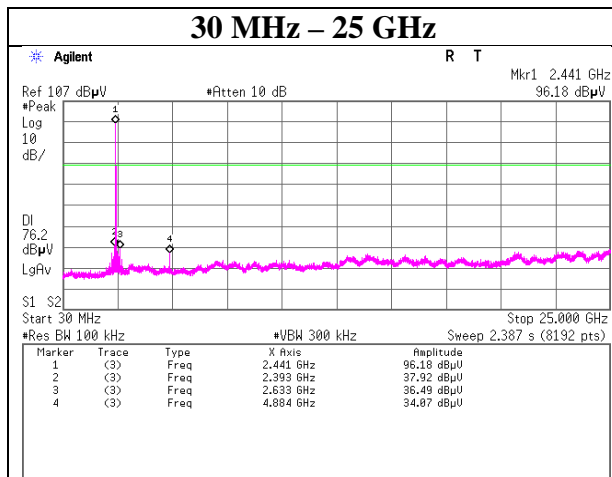
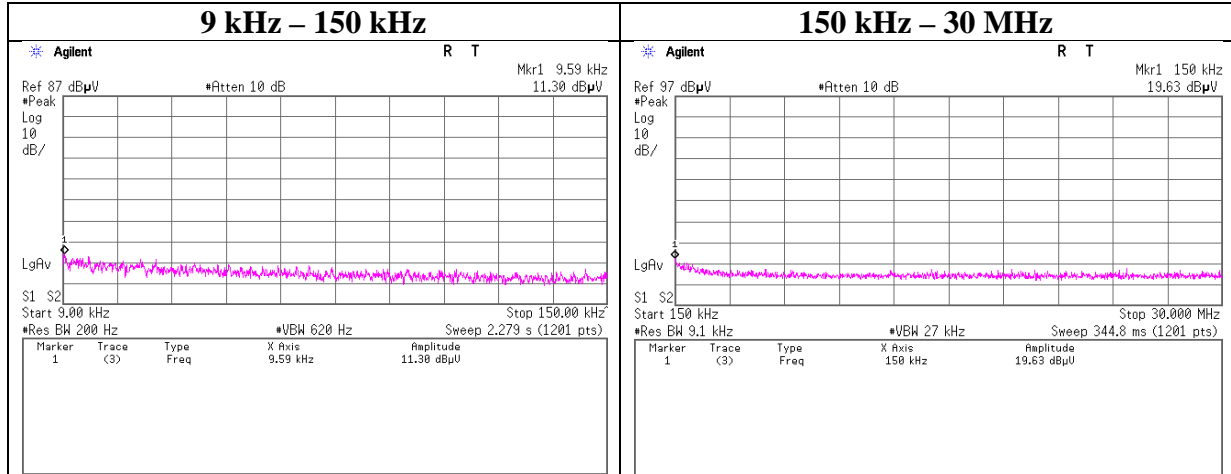
#### 2402 MHz



### Conducted Spurious Emission

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11138084H
Date	February 10, 2016
Temperature / Humidity	21 deg. C / 22 % RH
Engineer	Yutaka Yoshida
Mode	Tx DH5

#### 2441 MHz

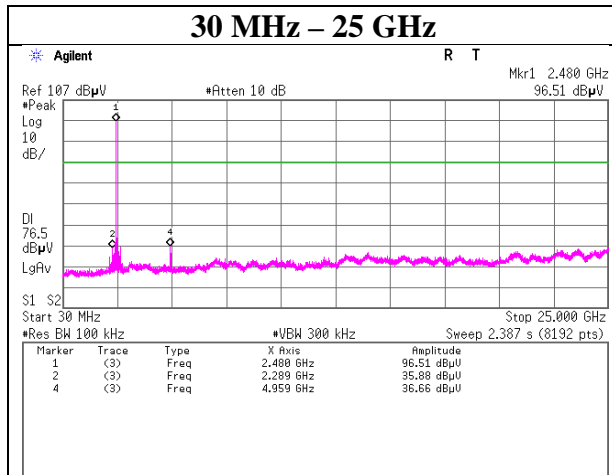
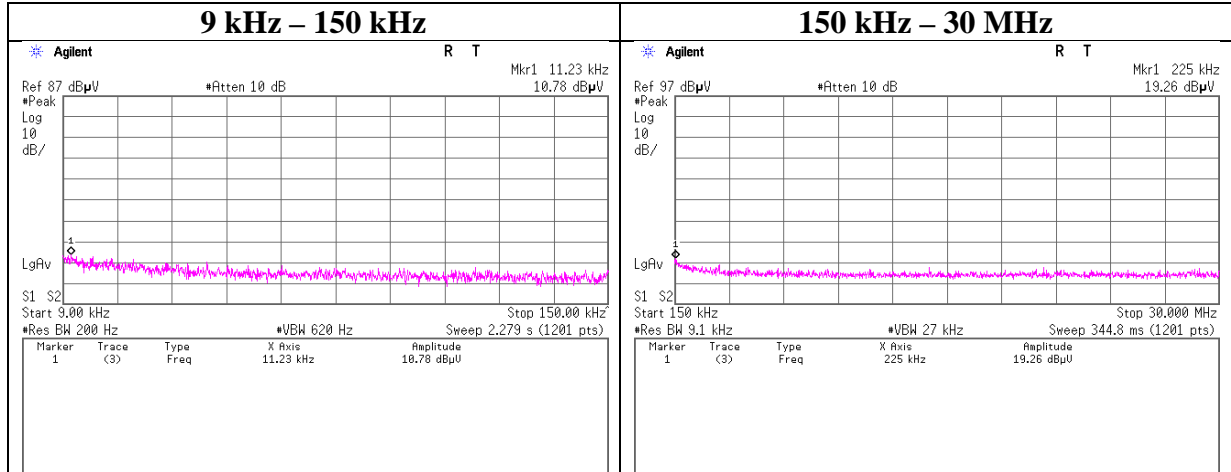




## Conducted Spurious Emission

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11138084H
Date	February 10, 2016
Temperature / Humidity	21 deg. C / 22 % RH
Engineer	Yutaka Yoshida
Mode	Tx DH5

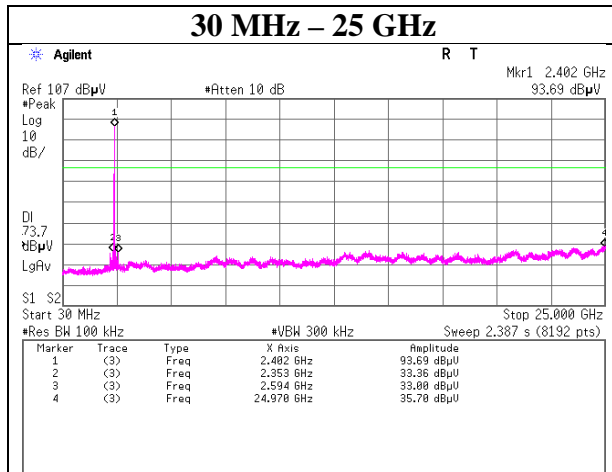
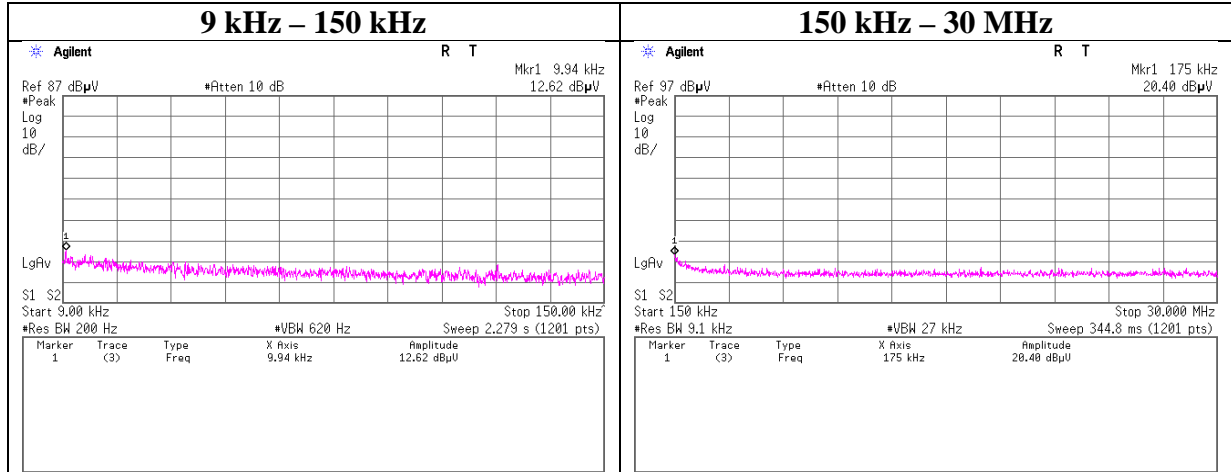
### 2480 MHz



### Conducted Spurious Emission

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11138084H
Date	February 10, 2016
Temperature / Humidity	21 deg. C / 22 % RH
Engineer	Yutaka Yoshida
Mode	Tx 3DH5

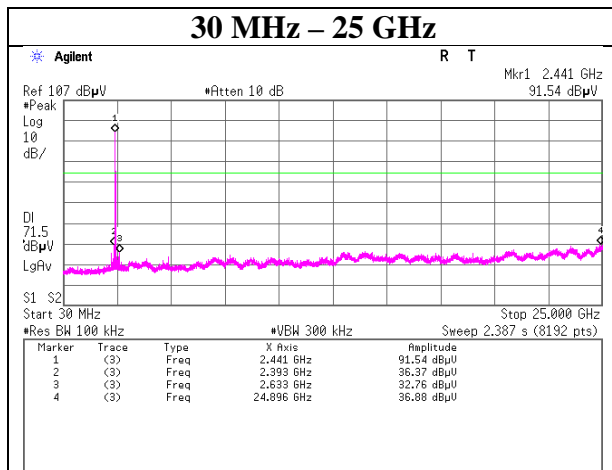
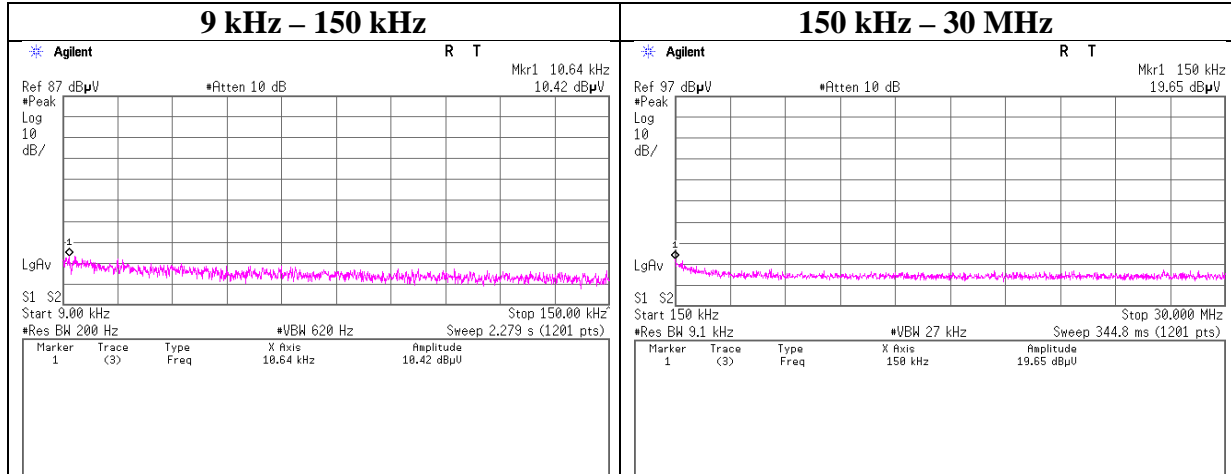
#### 2402 MHz



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11138084H
Date	February 10, 2016
Temperature / Humidity	21 deg. C / 22 % RH
Engineer	Yutaka Yoshida
Mode	Tx 3DH5

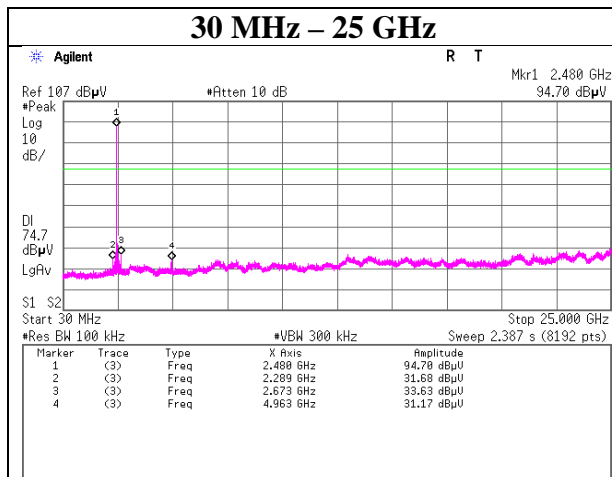
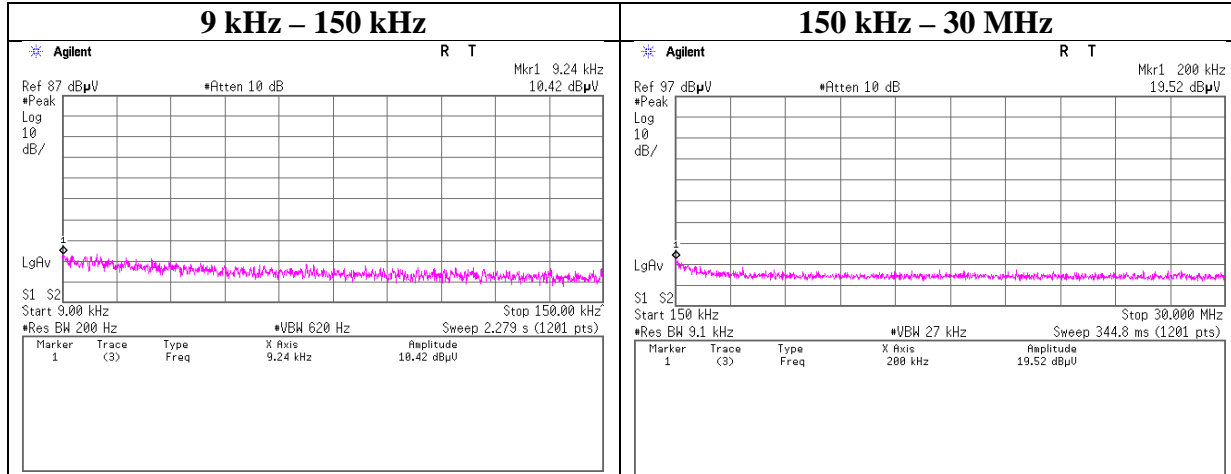
### 2441 MHz



## Conducted Spurious Emission

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11138084H
Date	February 10, 2016
Temperature / Humidity	21 deg. C / 22 % RH
Engineer	Yutaka Yoshida
Mode	Tx 3DH5

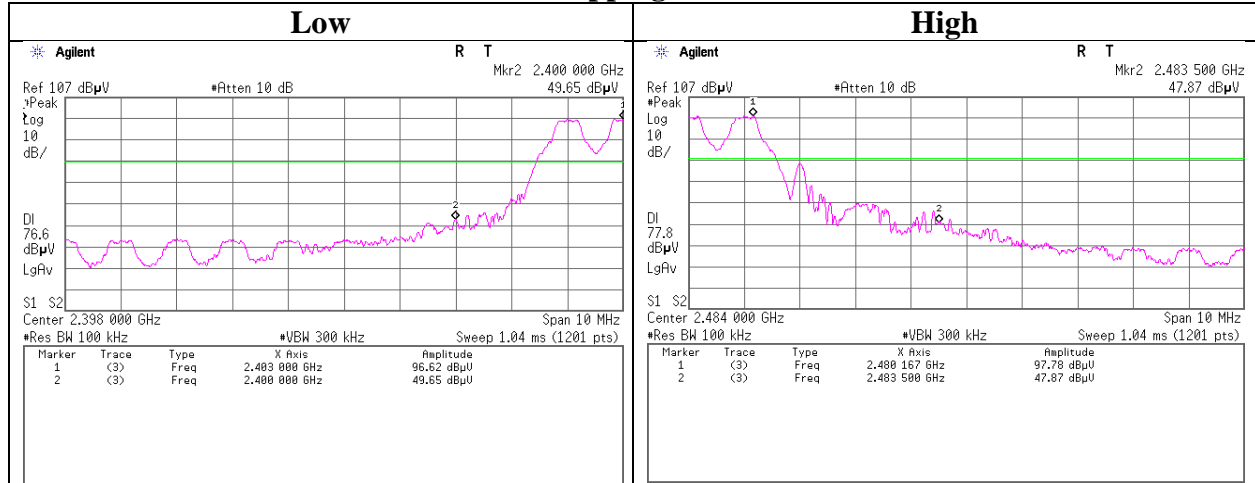
### 2480 MHz



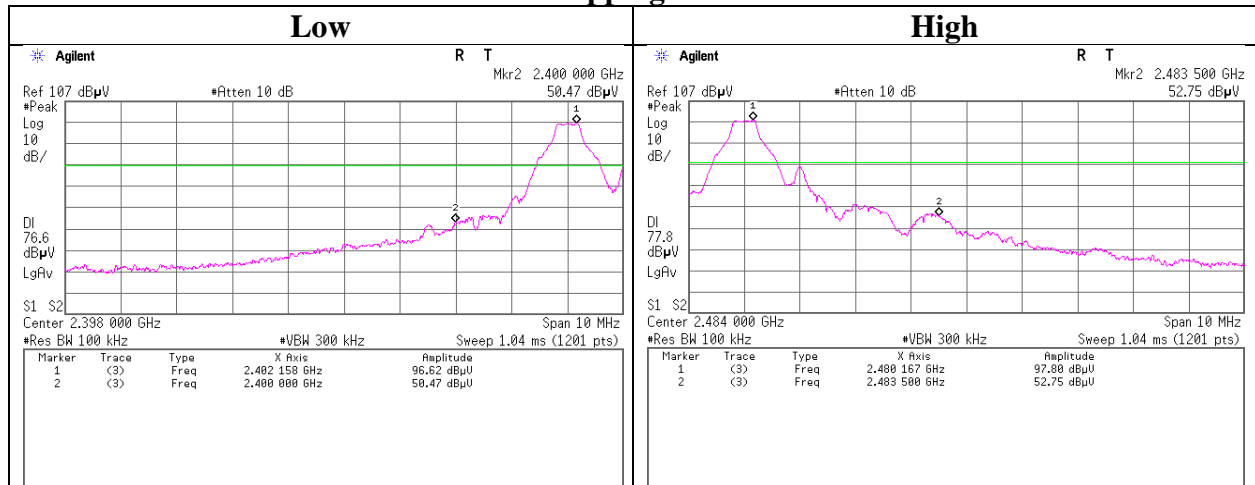
## Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11138084H
Date	February 10, 2016
Temperature / Humidity	21 deg. C / 22 % RH
Engineer	Yutaka Yoshida
Mode	Tx DH5

### Hopping On



### Hopping Off



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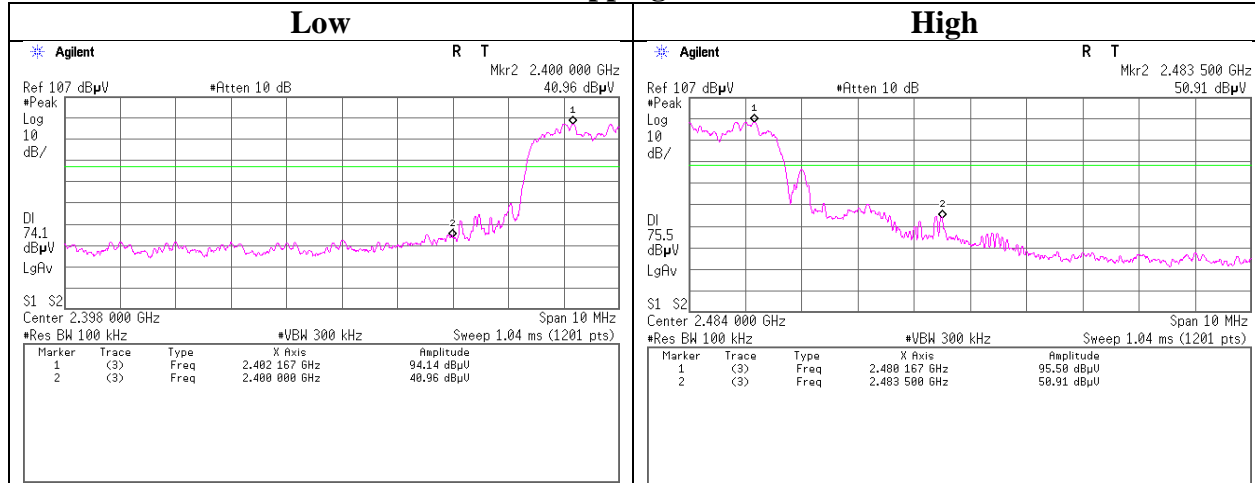
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

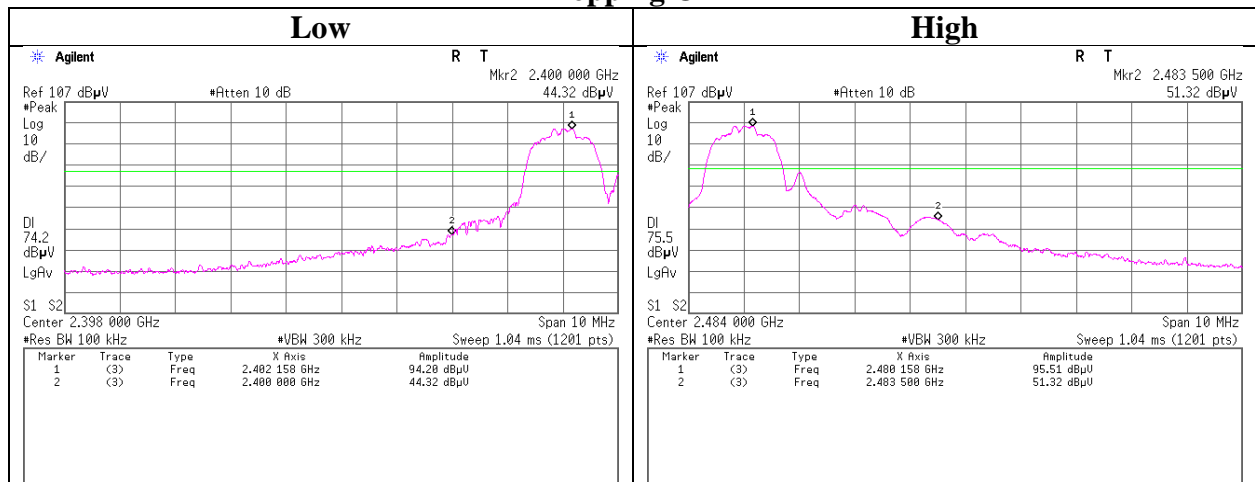
## Conducted Emission Band Edge compliance

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11138084H
Date	February 10, 2016
Temperature / Humidity	21 deg. C / 22 % RH
Engineer	Yutaka Yoshida
Mode	Tx 3DH5

### Hopping On



### Hopping Off



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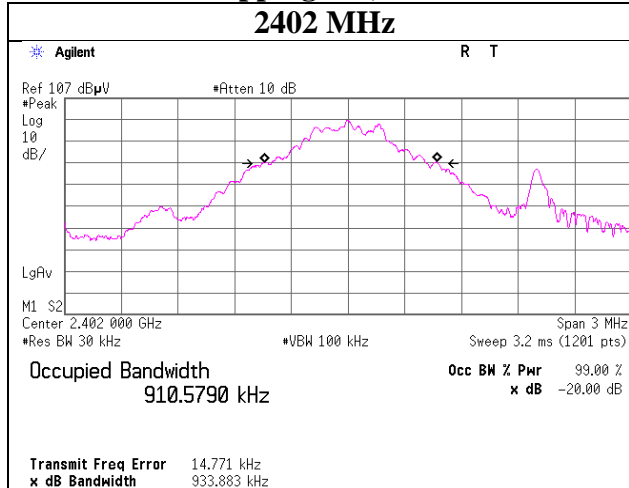
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

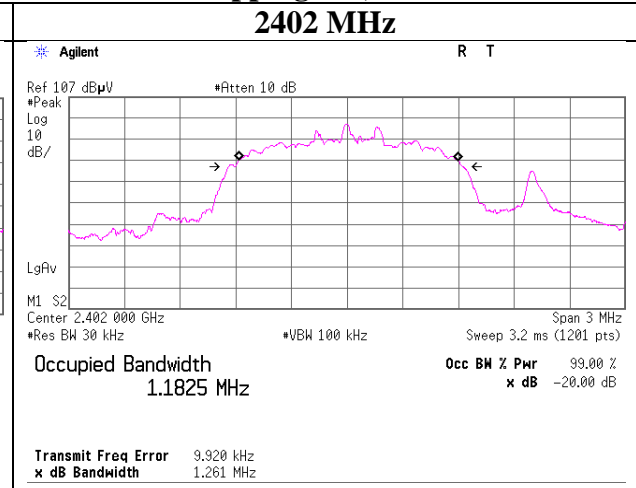
**99%Occupied Bandwidth**

Test place : Ise EMC Lab. No.7 Shielded Room  
Report No. : 11138084H  
Date : February 10, 2016  
Temperature / Humidity : 21 deg. C / 22 % RH  
Engineer : Yutaka Yoshida  
Mode : Tx Hopping Off

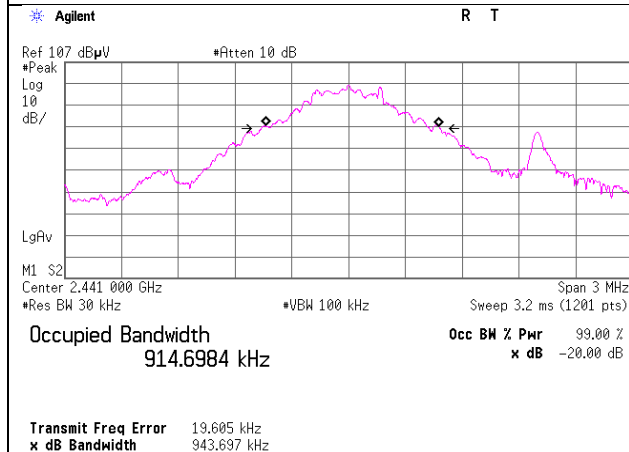
**Hopping Off, DH5**



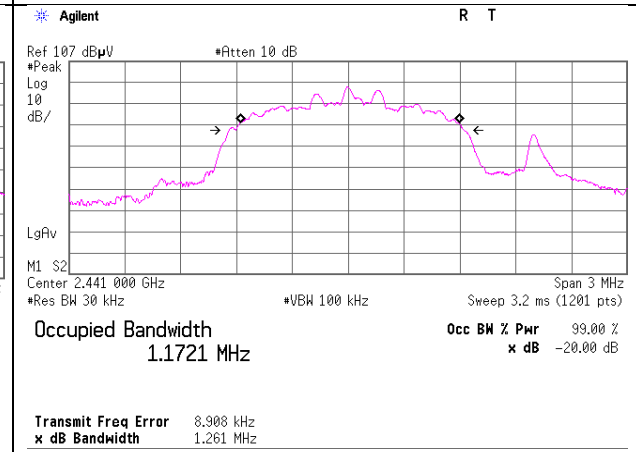
**Hopping Off, 3DH5**



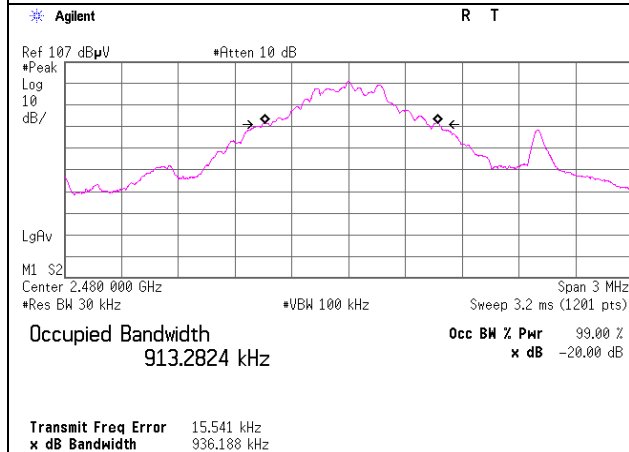
**2441 MHz**



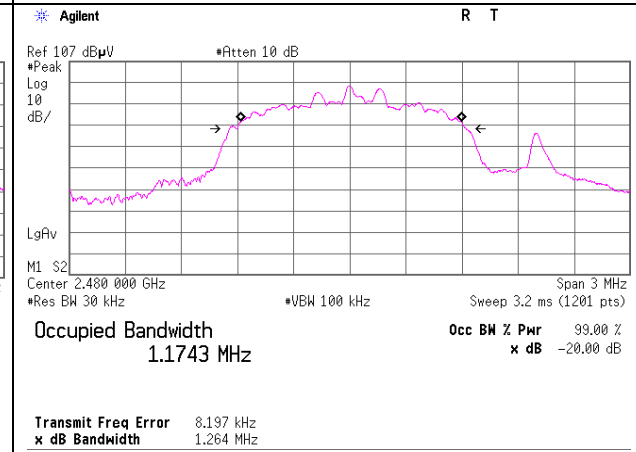
**2441MHz**



**2480 MHz**



**2480MHz**



**UL Japan, Inc.**

**Ise EMC Lab.**

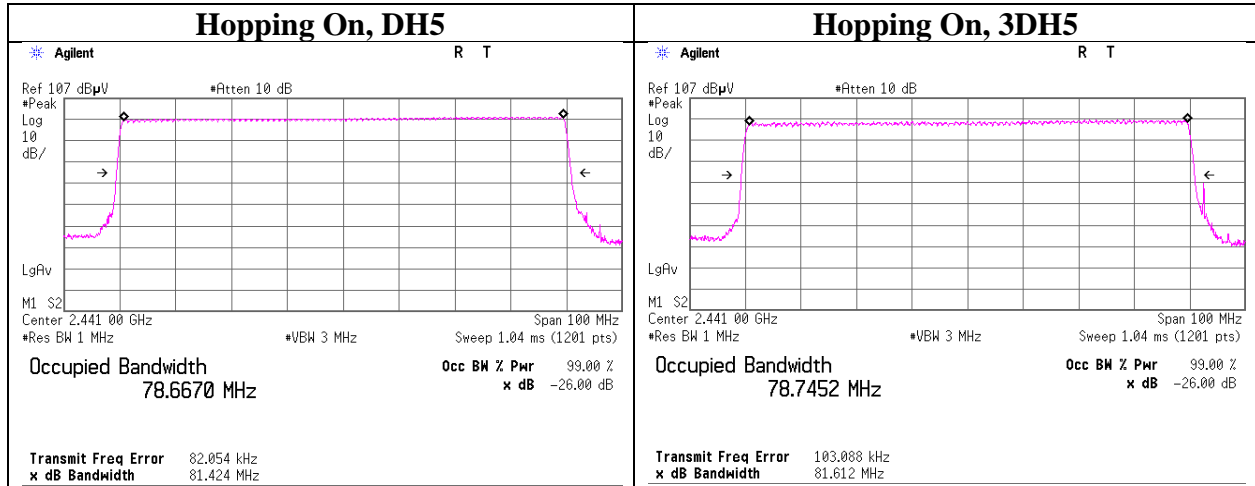
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Telephone : +81 596 24 8999

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## 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.7 Shielded Room
Report No.	11138084H
Date	February 10, 2016
Temperature / Humidity	21 deg. C / 22 % RH
Engineer	Yutaka Yoshida
Mode	Tx Hopping On



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## APPENDIX 2: Test instruments

### Test equipment (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE/CE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE/CE	2016/01/21 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE/CE	2015/05/18 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2015/05/18 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2015/05/21 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2015/03/19 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE/CE	2016/01/13 * 12
MHF-25	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	RE	2015/09/16 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ES140	100084	RE	2015/11/28 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2015/11/02 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2015/11/03 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2015/06/19 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2015/11/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2015/03/09 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2016/01/18 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2015/08/10 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2015/06/22 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2015/10/01 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2015/06/06 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE/CE	2015/09/02 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2015/10/11 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2015/07/13 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2015/04/08 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(AE)	2015/07/10 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE(EUT)	2015/07/10 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2016/01/12 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(3m)/ sucoform141-PE(1m)/ 421-010(1.5m)/ RFM-E321 (Switcher)	-/00640	CE	2015/07/02 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/01/14 * 12
MTA-28	Terminator	TME	CT-01	-	CE	2015/11/12 * 12

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**Test equipment (2/2)**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	AT	2015/11/06 * 12
MPM-09	Power Meter	Anritsu	ML2495A	6K00003348	AT	2015/10/19 * 12
MPSE-12	Power sensor	Anritsu	MA2411B	011598	AT	2015/10/19 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2015/03/18 * 12
MCC-66	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	AT	2015/04/02 * 12
MOS-34	Thermo-Hygrometer	Custom	CTH-201	3401	AT	2016/01/21 * 12

**The expiration date of the calibration is the end of the expired month.**

**All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.**

**As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.**

**Test Item:**           **CE: Conducted Emission test**  
                          **RE: Radiated Emission test**  
                          **AT: Antenna Terminal Conducted test**